

LOGWAR 15: Analysis Report

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A handwritten signature in black ink, appearing to read "E.D. McGrady".

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Abstract

This report describes the execution and analysis of a logistics game created for the Joint Staff J-4, Directorate for Logistics. The game centered on developing a better understanding of the requirements associated with the implementation of the Joint Logistics Enterprise (JLEnt).

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Executive Summary

The Logistics Wargame (LOGWAR) initiative is a Joint Staff J-4 led biennial wargame series focused on the development and implementation of the Joint Logistics Enterprise (JLEnt). In its most idealized form, a JLEnt response would have the unity across all responding organizations to integrate and synchronize a global logistics response to any crisis event. Compared to the current mechanisms for interaction and collaboration, the JLEnt concept imagines a much wider and deeper interaction not only among the various military services and other branches of the U.S. government, but also between industry, the commercial sector, nongovernmental organizations (NGOs), international organizations (IOs), coalition partners, and allies. To that end, the Joint Staff J-4 Directorate for Logistics directed CNA to develop LOGWAR-15 (the first wargame in a series of wargames) to assist in the implementation of the JLEnt. Envisioned as the first step in attempting to solve a complex and nebulous problem, LOGWAR-15 was designed to be more exploratory rather than analytically rigorous. LOGWAR-15 was used to help clarify the landscape of issues that could plague the JLEnt and to inform the next, more complex wargame.

LOGWAR-15 was set in a fictitious country in the Southern Pacific in the context of a complex humanitarian contingency. It was designed to challenge players into thinking about the best methods to maximize the value derived from improved collaboration and on the best possible implementation of the JLEnt concept. LOGWAR-15 took place from 21-23 July 2015 and was held at the Center for Naval Analyses (CNA). There were 71 participants from across the logistics and medical enterprise. It should be noted that due to the imbalance of military participants in LOGWAR-15, the key observations were primarily through the lens of the Department of Defense (DoD).

Based on our observations, we have three key findings. First, the strategic objectives of supporting the wider recovery efforts must be explicitly defined as part of the mission for the operational forces. Without defined broader strategic objectives, the logistical response tends to revert to a stove-piped organizationally focused construct that discourages collaboration and coordination, and thus leads to inefficiencies and reduced effectiveness. JLEnt collaboration is therefore reserved to ad hoc coordination at the tactical level. This stove-piped construct becomes particularly problematic in a resource constrained environment.

Second, there is a need for a flexible framework that allows for organizations to interact, particularly when various organizational structures are radically different. Having this framework in place enhances the agility, responsiveness, and effectiveness of the logistical response. This framework is further augmented when organizations develop and maintain a team of logisticians and operators with experience working across the traditional boundaries between military services and non-military entities (e.g., NGOs).

Finally, ensuring that participants have equal standing is an important part of maintaining a collaborative and coordinated response. If the concept of the JLEnt is built on the premise of wider and deeper interactions, then all participating organizations must feel as if they have a voice. While it should also be understood that not all voices are equal, to the best extent possible, all voices must be heard and acknowledged.

Other findings that came out of LOGWAR-15 are:

- When the DoD played a central role in logistics (e.g., the support coordinator for the JLEnt), it became increasingly difficult for the DoD to disentangle and disengage itself from the operation.
- There is an overall lack of awareness of the available capabilities of participating organizations (e.g., in LOGWAR-15, that capability was rotary-wing aircraft).
- Stemming from the lack of certain capabilities for various organizations, asset allocation also became a problem for the JLEnt (e.g., for counterinsurgency combat operations, U.S. combat forces also required the same helicopters that were being used for aid delivery).
- The acceptance of the networked concept for managing inter-organizational logistics will need to occur both when the DoD is the lead for a JLEnt response and when the DoD is integrated into or supporting a JLEnt response.
- It will be important to integrate operational forces into the JLEnt concept to allow two-way provision of combat resources and logistics.
- Barriers in communication (such as lack of common lexicon, DoD classification, and differing modes of communication) need to be overcome in order for the JLEnt concept to be operationally successful.

This report describes the objectives and execution of LOGWAR-15, as well as observations and comments collected during the game. LOGWAR-15 is not intended to be an end state, but rather the first of many efforts designed to better leverage the JLEnt. This report proposes the next steps in the LOGWAR process.

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Acronyms

AAV	Assault Amphibious Vehicle
AETF	Air Expeditionary Task Force
AEW	Air Expeditionary Wings
AGILE	Advancing Global Integrated Logistics Effort
ARG	Amphibious Ready Group
BCT	Brigade Combat Team
CAB	Combat Aviation Brigade
CCJO	Capstone Concept for Joint Operations
CCAD	Corpus Christi Army Depot
CE	Complex Emergency
CFMCC	Coalition Forces Maritime Component Commander
CMOC	Civil Military Operations Center
COMNAVAIRLANT	Commander Naval Air Forces Atlantic
COMNAVAIRPAC	Commander Naval Air Forces Pacific
CONREP	Connected Replenishment
CONUS	Continental United States
CSG	Carrier Strike Group
DCAM	Defense Medical Logistics Standard Support's Customer Assistance Module
DHA	Defense Health Agency
DLA	Defense Logistics Agency
DMSS	Defense Medical Logistics Standard Support
DOD	U.S. Department of Defense
DOS	U.S. Department of State
DOT	U.S. Department of Transportation
ELRA	East Lemurian Reconstruction Authority
EUROCOM	U.S. European Command
FEMA	Federal Emergency Management Agency
FLOW	Focused Logistics Wargames
GE	General Electric
HADR	Humanitarian Assistance and Disaster Relief
HERO	Hazards of Electromagnetic Radiation to Ordnance
HN	Host Nation
HQMC APWQ-52	Headquarters Marine Corps Weapons Requirement Branch
IMA	Intermediate Maintenance Activity

IO	International Organization
IV	Intravenous
JCL	Joint Concept for Logistics
JCLE	Joint Concept for Logistics Experiment
JFC	Joint Force Commander
JFACC	Joint Force Air Component Commander
JFLCC	Joint Force Land Component Commander
JFMCC	Joint Force Maritime Component Commander
JLEnt	Joint Logistics Enterprise
JMPT	Joint Medical Planning Tool
JOMIS	Joint Operational Medicine Information Systems
JTF	Joint Task Force
LCAC	Landing Craft Air Cushioned
LCU	Landing Craft Utility
LNO	Liaison Officer
MARO	Mass Atrocity Response Operations
MAW	Marine Aircraft Wing
MCRW	Medical Contingency Requirements Workflow
MEF	Marine Expeditionary Force
MEFHBR	Mean Engine Flying Hours Between Removals
MEU	Marine Expeditionary Unit
MRAP	Mine-Resistant Ambush Protected (vehicle)
MSF	Médecins Sans Frontières
MTBR	Mean Time Between Removals
NSN	National Stock Number
NGO	Nongovernmental Organization
NORTHCOM	U.S. Northern Command
OCONUS	Outside the Continental United States
OSD	Office of the Secretary of Defense
PACOM	U.S. Pacific Command
PN	Participating Nation
POL	Petroleum, Oil, and Lubricants
PPE	Personal Protective Equipment
PVO	Private Voluntary Organizations
SME	Subject Matter Expert
SOUTHCOM	U.S. Southern Command
TLAMM	Theater Lead Agent for Medical Materiel
TMIP-J	Theater Medical Information Program-Joint
TRANSCOM	U.S. Transportation Command
UDP	Unit Deployment Program
UGF	Underground Facilities
UN	United Nations
UNHCR	UN High Commissioner for Refugees

UNHRD	UN Humanitarian Response Depot
UNICEF	United Nations International Children's Emergency Fund
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USA	United States Army
USAF	U.S. Air Force
USAID	U.S. Agency for International Development
USJFCOM	United States Joint Forces Command
USMC	U.S. Marine Corps
USN	U.S. Navy
VERTREP	Vertical Replenishment
VTC	Video Teleconference
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme
WHO	World Health Organization

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Background

History of LOGWAR

In the late 1990s, the commanders and directors of the service and joint logistics organizations supported an initiative to assess joint logistics doctrine, evaluate various technological breakthroughs, and develop a list of desirable operational capabilities [1]. The three complete wargames that resulted from this effort—in 1999, 2001, and 2003—were known as the Focused Logistics Wargames, or FLOW. The key themes that were highlighted in the after-action reports from these games demonstrated, among other things, the need to improve the visibility of resources, the need for interoperability among all actors, and the importance of implementing a collaborative model for managing assets [2].

Drawing upon the work that followed from the FLOW initiative, LTG Kathleen Gainey issued the 2010 Joint Concept for Logistics (JCL) [3]. This document outlined the requirements for an enterprise solution to the increasingly complex logistical requirements; this was the initial draft for the concept of a Joint Logistics Enterprise, or JLEnt. The goals for JLEnt were to: integrate and synchronize the logistics responses; provide a unity of effort across the entire logistics response; and network the response seamlessly into the global information system [3]. The expected result would be the delivery and sustainment of logistical support to the Joint Force Commander wherever joint forces are deployed. In addition, the JCL was tailored to the Capstone Concept for Joint Operations (CCJO) [4] to insure the alignment between operations and their logistics support systems.

In 2011, the United States Joint Forces Command (USJFCOM) issued the Joint Concept for Logistics Experiment (JCLE) Baseline Assessment Report [5]. This report was intended to “provide a broad understanding of the underpinnings of the JLEnt solution.” Within this discussion were two components: a discussion of the need to view a JLEnt approach in the context of social networking, and a survey and cataloging of the logistics-related documents that, at the time, would have been important to implementing the JLEnt concept. The goal was to provide “the intellectual linkage between the JLEnt...and the notion that improved social network principles and best practices can result in more rapid and precise delivery of logistics....”[5] The resulting list of best practices that was presented as underpinning a “successfully operationalized JLEnt” were: leveraging of existing

networks; working towards a common awareness of key JLEnt participants and their goals and objectives; accounting for different backgrounds, perspectives, and cultures; awareness of barriers hindering information exchange across the social network; focusing on building trust relationships; attempting to build consensus on common objectives and goals; embracing emergent logistics networks; developing strategies for linking network nodes; developing strategies to enhance participation in the social network; and developing logistics planners with competency in social networking.

A year after the release of the Baseline Assessment Report, LtGen George Flynn, J7, and Lt Gen Brooks Bash, J-4, of the Joint Staff issued a guide for logisticians entitled “Operation of the Logistics Enterprise in Complex Emergencies.” This guide set out to codify a set of best practices and principles to facilitate communication and collaboration within the JLEnt approach [6]. In addition, the Joint Staff extended the JLEnt discussion to encompass non-military organizations, and included the complicated roles that the U.S. military services might play in complex emergencies. As with the previous documents that outlined the concepts of the JLEnt [2-5], the emphasis was on a group of core issues related to the impact and consequences of pursuing a social network response, such as the JLEnt. These issues included: the need for the community of interest to rapidly share information and resources; the importance of “harmoniz[ing] the prioritization of resources”; and ensuring that the JLEnt efforts incorporate non-DoD equities without “blunt[ing] or blurr[ing] statutory authorities, regulatory responsibilities, or the ‘higher callings’ that are the reasons that these organizations exist.” [6]

Following from these initial efforts, Gen Dempsey, Chairman of the Joint Chiefs of Staff, directed the Joint Staff’s J-4 to “continue to develop and implement the Joint Logistics Enterprise” via the LOGWAR initiative. As a progressive series of wargames focused on the JLEnt concept, LOGWAR would help improve the understanding of capabilities across the JLEnt, provide a venue for realistic and credible logistics play in war games, and help to identify and explore long-term sustainment issues.

Several months after LOGWAR-15, J-4 officially changed the name of the LOGWAR campaign series to AGILE (Advancing Globally Integrated Logistics Effort). For the purpose of this report, the campaign will still be referred to as LOGWAR, but any subsequent reports will refer it by the new AGILE moniker.

Broadening the concept of Joint logistics

As part of this JLEnt concept development in the mid-2000s, the leadership of the Joint Staff began to expand the scope of the term *joint* as applied to logistics [3, 7]. Typically, the meaning encompasses the interaction, cooperation, and collaborative actions of the four U.S. military services (Army, Air Force, Navy, and Marine Corps). However, LTG Gainey, then-Director of J-4, and ADM Michael Mullen, then-Chairman

of the Joint Chiefs, posited that while the demand signal for the commitment of U.S. resources would continue unabated, those resources would become increasingly scarce because of budgetary pressures. As a consequence, the

“Joint Force Commanders will become more reliant on multinational, interagency, nongovernmental, and contracted capabilities and partnerships” [3].

In anticipation of this reality, LTG Gainey and AMD Mullen advanced the concept of the Joint Logistics Enterprise (JLEnt)

“to integrate our DoD capabilities (deployment and distribution, engineering, operational contracting support, logistics services, maintain, supply, and medical logistics) with those from the interagency, multinational, nongovernmental, and commercial world” [3].

Figure 1 gives a qualitative representation of the entities included in the JLEnt concept as well as some of their relationships. It is important to note that there is no distinct JLEnt. The JLEnt is simply collection of organizations focused on a problem whose membership will ebb and flow as the objectives of that goal change. In short, the JLEnt is whatever it has to be and Figure 1 is one permutation of a JLEnt. There is no standard table of organization or equipment. It is this nebulous nature that makes operationalizing the JLEnt so challenging.

Interactions between these entities are not new, but in the past, they have frequently occurred either at the upper strategic level of ambassadors, theatre commanders, and heads of government, or at the extreme tactical level of the individual service member, responder, or civilian. In addition, the interactions have been relatively informal and often ad hoc.

The Joint Staff J-4’s charge was to answer the following questions:

- How do we implement the JLEnt concept?
- How can the organizations associated with a JLEnt response maximize the value derived from their collaboration?

The goal of LOGWAR is to develop an enduring collaborative mode of operation, extending beyond DoD, which would allow for logistical responses to be optimized across entities and be able to provide support to multiple contingencies simultaneously. LOGWAR-15 was the envisioned to be the initial step in an iterative multi-year process to answer the above key questions.

Figure 1. Qualitative representation of the contributors and relationships within the JLEnt concept



Source: Joint Staff J-4 created image.

Game Objectives and Requirements

The J-4's objective is to progress incrementally in the development of a roadmap for logistical responses that are flexible, collaborative, and effective. To support these initiatives and to help provide a clearer path to implementing a JLEnt construct, the Joint Staff J-4 tasked CNA with developing a series of games called LOGWAR that bring together participants from across the various logistics communities. LOGWAR-15 is the first incremental step in that campaign, with the expectation that additional wargames and analytic pieces in the campaign would build on previous LOGWAR outputs. As a critical component of the first step in this development, LOGWAR-15 was more exploratory than analytically rigorous. The aim was to map out and understand the problem space within JLEnt more fully and generate buy-in from both inside and outside of the DoD for future LOGWAR events.

JLEnt concept's doctrinally defining documents [3, 7-8] identify the need to improve visibility throughout the logistical community, increase interoperability, and prepare for increasingly complex environments. These objectives are part of the effort to foster communication and reveal the potential opportunities for collaboration.

Critical to making the above a reality is building trust between stakeholders so as to increase the likelihood that they will be willing to invest their political capital in the JLEnt process and work toward sharing requirements and coordinating their efforts.

The resultant outcome is one where the stakeholders understand and support each other and can re-purpose their capabilities as needed to achieve the desired end state as quickly and efficiently as possible.

LOGWAR-15 took place over two and a half days in July 2015 and focused on identifying friction points within the JLEnt governance structure. Early in discussions with the Joint Staff J-4, CNA determined that the first component of successfully implementing the JLEnt concept is demonstrating its value to the major stakeholders, specifically the U.S. military services. As a consequence, answering the question, “What value does the JLEnt approach bring to operations?” became as important in the design of the game as “How do we implement the JLEnt concept?”

To explore these questions, LOGWAR-15 required participation by the diverse actors that would be associated with a JLEnt response—across the full range of possible contexts—as they grappled with the issues that they would likely be called on to address. (See Figure 2.)

Figure 2. LOGWAR-15 participants, contexts, and issues



The need to maintain its accessibility and relevance to the entire JLEnt community stipulated that the game be at the unclassified level. It also restricted the focus of the game, in that a game focused primarily on combat operations would have negligible interest to anyone who was not from the military. At the same time, the game structure had to be relatively familiar to the participants to minimize the learning curve associated with manipulating the game machinery. Finally, J-4 identified medical logistics as a specific area of interest [9].

Game Design

In response to this guidance, CNA built a game centered on a fictitious, large-scale contingency in the Southern Pacific. In the scenario, a regional aggressor (West Lemuria) undergoes a political collapse, and the United States,¹ its allies (East Lemuria), and coalition partners are drawn into the aftermath. At the same time, the United States experiences a major earthquake in the Pacific Northwest.² The game book [10] includes a more extensive description of the scenario.

For the purpose of the game objectives, the specifics of the scenario and game elements were largely unimportant. For example, while the game focused on topics such as aircraft engines, these game elements were chosen because they were broadly representative of wider issues and interactions in the JLEnt framework. The game was designed to stimulate and capture player interactions and is agnostic to the deliberations on the specifics of aircraft engines, X-ray machines, or medical supply logistics.

Table 1 lists the characteristics of the items used to highlight the interactions between the LOGWAR-15 participants. These items were selected in order to ensure the widest applicability to the entire JLEnt community.

¹ The scale of the United States' commitment is in the form of two Marine Expeditionary Forces, five Amphibious Ready Groups (ARGs), two Carrier Strike Groups (CSGs), four Army divisions, and an Air Expeditionary Force. In addition to the U.S. forces, the East Lemurians and Koronans (a coalition partner) provide military and non-military support.

² During LOGWAR-15, this component was scripted to complicate the logistics issues without requiring extensive play.

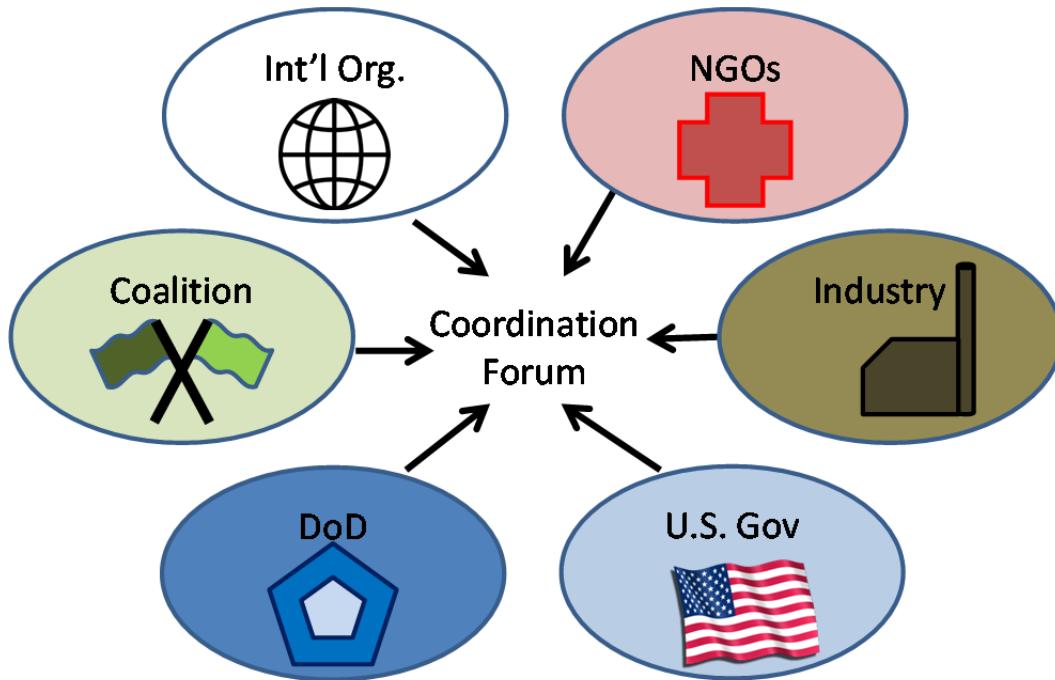
Table 1. Item characteristics

Bulky and heavy; requires special handling equipment; delicate components; commercially supplied; single production facility; not stocked in forward area; key enabler; single function; requires large maintenance facility; high per unit cost	(Tilt-rotor aircraft engine for Osprey)
Moderate size; delicate components; single production facility; key enabler; widely available; multiple function; high demand; high per unit cost; shared with international partners	(Rotor aircraft engine for Apache and H-60 variants)
Moderate size; fragile; limited supply; widely used; expensive and difficult to repair; issues with retrograding	(X-ray machines)
Small in size; broad functionality; large quantities needed; specialized handling and storage requirements; limited shelf life; used by many actors; often in short supply; restrictions on sourcing; contamination concerns	(IV solutions)
Small in size; multiple variants with limited interchangeability; requires advanced training to use; often in short supply; restrictions on sourcing; specialized handling and storage requirements; easy to transport; some stock piling; typically used by many actors	(Antibiotics)
Heavy; requires bulk lift capability to deliver; widely disseminated throughout action space; critical enabler for broad spectrum of capabilities; widely available; used by many different actors	(Generators)
Small size for each unit; used in large quantities; widely available; handling restrictions, specifically with respect to water; retail distribution issues; constant resupply required	(Water purification chemicals)

During the final planning conference, participants³ formed along the six previously identified sectors of the JLEnt. This organic grouping of players reflected their real-world roles and areas of expertise; each group represents one of the major communities likely to be a part of the JLEnt approach (Figure 3).

³ The list of participants was generated via collaboration between the Joint Staff J-4 (the sponsor) and membership of the oversight group.

Figure 3. LOGWAR-15 organizational construct



There were a total of 71 participants in LOGWAR-15: 47 from various medical organizations throughout DoD; 9 from the commercial sector, primarily from transportation and trade organizations; 6 from U.S. government agencies associated with overseas humanitarian responses; 6 from various allies; 2 from the United Nations representing international organizations; and 1 from the Red Cross for the nongovernmental organization community. A detailed list is provided in Appendix F.

The participants were given a series of vignettes describing different aspects of the scenario, such as insurgency, disease, and transportation. For each vignette, following an explanatory brief describing the relevant details, the participants were led through a series of facilitated discussions in which they were asked to identify the issues that they thought would arise, and then develop a JLEnt response.

To do this, the participants first worked within their communities to articulate their specific equities, capabilities, and requirements. Groups worked independently but were encouraged to interact with other groups as they saw fit.

As the participants debated their actions and developed their responses, the game observers documented how the participants moved through the process cycle of the

logistical response. Based on the details of each vignette, the control cell outlined the demand signal for resources as well as any relevant restrictions. The participants then discussed how they would go about mapping their specific capabilities to the individual, local demands, how they would determine what was missing, and who they would approach to help mitigate the gaps. From there, the individual solutions were bundled into the overall response, taking into account the possibility that it might need to be phased due to a shortage of resources or limitation on access. After mapping out their initial plan, the participants discussed how to source, transport, and deliver the resources to the end user.

Analysis, Discussion, and Findings

Implications of a Complex Emergency (CE)

The scenario used in this game—a relief/recovery operation in the wake of a large conflict—falls under the category of "complex emergency (CE)". A CE involves relief or recovery operations, during which military or civil forces also must deal with the threat of violence. U.S. operations in Somalia (Restore Hope) and Haiti (Uphold Democracy) are classic examples of CEs. CEs are characterized by complex sets of relief and recovery requirements superimposed on a low-intensity but potentially dangerous security environment. It should be noted that, in this paper, we are using the term CE to refer exclusively to a humanitarian operation with a security component, which follows the humanitarian community's use of the term [12].

By constructing a game scenario involving a CE event in a fictitious island archipelago nation, LOGWAR-15 was able to examine:

- the complex interactions of the various JLEnt organizations;
- how the JLEnt operated as part of a mass atrocity response;
- the movement of logistics in a maritime domain;
- a medical logistics enterprise response.

The following section details each of these areas and the implications of this particular scenario on the design and play of the event participants.

JLEnt in support of a complex emergency

In the game scenario, a failed authoritarian state, West Lemuria, presented a sufficient security threat to its neighbor East Lemuria that a coalition operation was undertaken to stabilize the country and ultimately remake it in the image of the westernized East Lemuria. The challenge was that while coalition forces easily overcame the regular military forces of West Lemuria, loyalists formed an insurgency that presented an irregular threat to relief and recovery operations. In the game scenario, loyalist remnants of West Lemurian forces were conducting active attacks

against coalition and nongovernmental forces that were attempting to provide relief supplies to the West Lemurian people. In some cases, these forces had indirect fire weapons in addition to small arms. In other words, the threat was significant and still quite dangerous. However, the humanitarian situation demanded that the coalition forces do something to prevent mass casualties among the population.

West Lemuria was geographically disaggregated into an archipelago of islands, with several regions presenting distinctly different challenges to operating forces. This required sea, air, and ground transportation to move relief supplies, and it required security both ashore and at sea.

Game designers and players had to imagine the role of the JLEnt in providing medical support to the affected populations. To do this, coalition and other organizations could either provide it directly, or work with each other to support and supply those who were in the field. In this section, we examine the challenge of operating the JLEnt in the context of this complex threat.

The JLEnt posits two fundamental departures from current operational concepts: non-military organizations providing logistics in support of military operations, and military forces facilitating the provision of logistics support by non-military organizations to civilians where military forces would otherwise be required to provide the support. In other words, non-military organizations would support U.S. military operations in a linked, networked way that reflects a more integrated supply-demand relationship than currently exists. The JLEnt is envisioned to work like a social network, with links occurring between a wide range of participants as opposed to a top-down or hierarchical structure.

This loss of hierarchy and networked nature of the JLEnt can be compared to previous incarnations of aid provision:

- **Host nation (HN) lead.** In this case, the HN is primarily responsible for coordinating aid, and organizations fall into its overall command and control structure for emergency response. This works best in developed countries. In this scenario, it presented a substantial challenge to the JLEnt as the HN was perceived by everyone as capable even though it lacked the experience or resources to manage a large logistics enterprise. It had to rely on partners for support, but those partners had to also help the HN save face and be perceived as in charge of the operation.
- **Logistics cluster.** The response community has developed the logistics cluster concept [13], which is centered around UN doctrine. The logistics cluster provides coordination, information management, and when other groups fail, logistics service provision. The cluster concept is somewhat top-down, with support provided by the World Food Program's Global Logistics Cluster to set up individual clusters and to track capacity and items online.

- **Civil Military Operations Center (CMOC).** The CMOC is a prior incarnation of the JLEnt and was designed as a central coordination center during a CE that brought together NGOs and UN personnel with military reps, to deconflict operations and discuss possible areas of military support. This is a tactical enterprise that is designed primarily to allow organizations operating in the same areas as the U.S. military to coordinate their activities (i.e., to inform the U.S. military and each other about what they are doing) and to request security and transportation support from the U.S. military. It also provides the U.S. military with the opportunity to inform other organizations about issues or requirements it might have. The CMOC was designed to assist commanders in understanding the operating environment, to coordinate resources and capabilities, and to synchronize operations across the multitude of organizations involved in civil (as opposed to combat) operations [12]. The creation of the UN Cluster system has taken over many of the major roles and responsibility once facilitated by the CMOC.

The JLEnt differs from these organizational concepts in several ways:

- It assumes a social network model, which differs from the operations center concept of the CMOC (i.e., face-to-face meetings in the combat zone) and from the hierarchical models of the lead/follow model of emergency management.
- Its primary focus is logistics, while in a complex emergency security and combat power is often the thing that the U.S. military can provide when no one else can. In that sense, the CMOC, with its closer relationship to combat elements, is better integrated with operational requirements as a coordinating body.
- It does not provide a specific infrastructure in the way the cluster concept does, instead relying on coordination between various elements of the organizations involved.

In the game scenario, there were several basic organizational entities that could collaborate as part of the JLEnt:

- The East Lemurian military and government (also known as the Host Nation). The assumption was that the East Lemurian government had national sovereignty over both East and West Lemuria, allowing it to absorb West Lemuria into its Western-style democracy much like other recent reunifications.
- United Nations organizations (WHO, UNHCR, etc.). The UN had a humanitarian role through the World Food Program, a population movement and housing role through UNHCR, and a role in identifying,

supporting, and prosecuting international criminal acts (crimes against humanity). UN players raised the issue of using the UN's cluster concept to encompass the UN response rather than referring to specific UN organizations [13].

- U.S./HN government. For the United States, this would be the U.S. Agency for International Development through the Office of U.S. Foreign Disaster Assistance.
- US/HN non-governmental organizations (NGOs).
- International NGOs.
- Commercial and non-traditional suppliers. By "non-traditional," we are referring to organizations that do not usually participate in relief operations. In the case of the United States, this might be the role that Wal-Mart or Waffle House plays in natural disasters in the southeastern United States.

Within the context of a CE, several factors will challenge the JLEnt's ability to integrate logistics operations:

- The security situation
- The relationship of the HN to the JLEnt, and to the overall relief operation
- The complexity of logistics movement and requirements.

Security

In a CE, the U.S. military typically has the preponderance of force to carry out combat or security operations. However, in a scenario such as the one laid out here, East Lemuria and coalition forces also had a major role in providing security. We proposed a combined operation where forces were intermixed, with the coalition (East Lemurian) forces being the "face" of the operation and U.S. forces providing support and decisive fires where needed.

The HN and U.S. forces had been operating under a UN command structure left over from previous wars, which would mean that for at least part of the operation, the UN would be in command.

Thus, the JLEnt in the game would have been required to work not only when the U.S. military was involved, but also when the HN forces were in the lead, and when the U.S. was implementing its cluster system in support of UN operations. This implies a broad understanding and acceptance of the JLEnt concept.

In an actual operation, the U.S. military would have a significant role that would extend beyond most of its planning and operational concepts. The HN military forces would have significant shortfalls in one or more areas, most likely in logistics, support, and the ability to sustain operations. The situation would become so dire that there would be significant international and domestic pressure on the United States to do something, which would push the U.S. military into roles it was not necessarily resourced to perform. This has happened in almost every CE that has involved the United States.

How to manage this process of supporting East Lemurian forces as the “face” of the operation was clear in the game when it came to security. U.S. forces could stand off from the front lines and call fires in when East Lemurian forces became engaged beyond their capabilities. For logistics and logistics security, however, this would be problematic. This is because the geography of West Lemuria was dispersed and called for long-range logistics in difficult, multi-modal terrain. This meant that logistics lines would be stretched over isolated or difficult terrain, leaving them vulnerable to insurgent attacks. In addition, the insurgents were located in underground facilities (UGFs) where they were somewhat protected from U.S. and coalition ISR and indirect fires.

Ultimately, this would mean that:

- U.S. forces would be needed to escort logistics and support convoys to provide protection, or at least call fires, in support of logistics movement. This would stretch U.S. forces, including logistics forces, because the broken geography of the region would not easily lend itself to a hub-and-spoke distribution system.
- Coalition and nongovernmental forces would need to be defended while they were conducting resupply and relief operations due to the significant security threat. The standing doctrine of many nongovernmental, UN, and other organizations is that they will not work in an environment where there is a threat to their personnel. However this pressure would need to be balanced with the tremendous need posited in the game. It would either leave uniformed personnel with the majority of the relief mission, or present a challenge for those same uniformed forces to protect those doing the relief.
- HN forces would need to be the face of the operations but would need U.S. support for logistics, medical, and other service functions, in addition to help with security.

These factors would have forced U.S. forces, and the JLent, into a pattern seen in other operations: the security threat challenged the ability to conduct secure logistics overland or, in some cases, over water.

- This pushed logistics support for relief operations onto the U.S. military and coalition military forces, which were still fighting the war against loyalists and insurgents. U.S. military logistics were stressed trying to supply not only their own forces, but also those of the less capable East Lemurians.
- The sheer size of the disaster created by the war, the effect of revelations about how West Lemuria treated its population, and the potential for epidemic spread of disease created tremendous pressure to conduct the relief operations in the face of the insurgency (which led the insurgents to escalate their activities in order to stretch coalition forces).
- Given the security threat and ongoing military operations, nonmilitary sources of relief aid became problematic. Some moved forward despite the risk, while others—particularly commercial entities—became focused on the wholesale delivery of relief to ports of debarkation (both aerial and surface) and left it up to the military to do the actual delivery to areas or regions that required it (e.g., the "last mile" delivery). This further stretched military logistics capabilities.
- This demand for last mile services in relief situations almost always draws on helicopters as the primary means of transportation. In the game, this demand was made worse by the geography of West Lemuria, where the archipelago meant that USMC connectors, small craft, or helicopters would be doing much of the last mile delivery. Given that the connectors and helicopters were also of significant value to combat forces in counterinsurgency operations, this created an asset allocation problem.
- Instead of identifying methods of supply, the discussions and solution focused more about coordinating the last mile delivery, protecting key nodes, and securing supply routes with convoys. Security had to be provided to a range of entities, from the general population to East Lemurian reconstruction teams to NGOs providing medical care. Without the security, NGOs and reconstruction teams would have to withdraw, turning more of the operation over to U.S. and HN military forces.

Observations

Based on the effect that the security situation had in this game, we can make the following observations:

- The JLEnt will need to integrate into U.S. command and control as well as with allies and the UN in order to seamlessly transition from one phase of an operation to another. The acceptance of the networked concept for managing inter-organizational logistics will need to occur both when the United States is in charge and when the United States is integrated into a coalition

response. In the game, this was required because, even though the United States did not have the lead, it had the preponderance of logistics capability and capacity in the operation. If the United States had moved to a JLEnt capability, but must operate under a linear or cluster concept, then the advantages of the JLEnt may be lost or downgraded.

- The JLEnt does not provide a clear mechanism for maneuver and command elements to coordinate combat and security operations in support of other organization's logistics operations. In this sense, the JLEnt differs from a CMOC, where both logistics and operations personnel are incorporated into the coordinating mechanism. It will be important in the future to integrate operational forces into the JLEnt concept to allow two-way provision of combat resources and logistics.
- The JLEnt will be challenged by competing requirements for U.S. military lift capability in a CE. In a scenario such as the one we present here, the U.S. military may still find itself tasked for last mile logistics support to both relief and coalition military operations. The JLEnt may operate as an APOD/SPOD delivery capability, but rely on military forces operating under a CMOC concept for retail delivery of relief.

HN relations

One of the key factors in a failed state CE is that the HN has a tremendous influence on operations. In the game, we posited HN development teams that would follow-on behind combat forces and begin to establish a functioning government and infrastructure within West Lemuria. Given the ongoing security situation, these forces would require protection. In some areas, the West Lemurians had loyalists and criminal elements embedded with the population who were working against reunification and pacification. Law enforcement and a working courts system was required in order to prevent these elements from further alienating the population from the East. Abandoning the reconstruction would have meant that critical infrastructure would not have been back up and running fast enough to prevent mass casualties. Military forces were forced to provide security in order to reduce the overall threat and prevent mass casualties.

East Lemuria had significant governmental, national, and legal interests in actions in West Lemuria. This was brought out by the players, who were concerned about the international legal status of West Lemuria, and whether it had retained sovereignty or had been incorporated by East Lemuria. In the game, players assumed East Lemuria incorporated West Lemuria into its national territory. This led some players to suggest that responsibility for the response and security was East Lemuria's, and not a U.S. problem. That is, players suggested that the U.S. mission had ended with the reunification and now the challenge would fall to the East Lemurians and to the UN. However, given the scale and scope of the challenge, players assessed that it would

be unlikely for the United States to simply hand over the problem to East Lemuria. U.S. forces in theater were ordered to support reunification.

The legal and national frameworks involved present an interesting complication to the JLEnt as configured. Nongovernmental, commercial, or other interests participating in the JLEnt are effectively participating in the East Lemuria's logistics and recovery system, not the United States.⁴ The incorporation of East Lemuria, both civil and military logistics infrastructure into the JLEnt thus becomes critical for the JLEnt to succeed in this scenario. Not only must the East Lemurians be integrated into the JLEnt, they must adopt it and be capable of administering it as they will quickly become the lead for relief operations.

Observation

The legal, national, and policy considerations of working within a host nation may require the host nation to not only participate in the JLEnt, but to be capable of managing and implementing the JLEnt across their relief and military logistics enterprise.

Complexity

CEs are complex operations due to the combination of security and logistics requirements, which create a complex web of authorities and command arrangements. In the case of the game, the question of who was in charge of the operation arose several times and was never settled to the players' satisfaction. The questions and decisions relating to command and control in the game reflected the complexity of many real-world operations.

In a real-world operation, there would be multiple overlapping chains of command. In the game, this was incorporated by including the following scenarios:

- The UN had a long established commitment to maintaining peace and security between West and East Lemuria. When the conflict occurred, the kinetic phase of the fighting had been conducted under a multi-national, UN, command structure that incorporated U.S., HN, and other forces.
- Once the major conflict ended, however, the UN structure was superseded by the HN civilian government through the East Lemurian Reconstruction Authority (ELRA).

⁴ These issues can also occur in U.S. domestic response operations where federal forces and capabilities attempt to operate in a state or community with its own laws and regulations. For example, this can occur with licensure of medical personnel providing medical aid [9].

- However, minor hostilities were still on-going, which created a situation in which military force was still being used as the civil government was being established. This meant that the East Lemurian military commander, along with his coalition partners, shared some responsibility for security and combat operations in East Lemuria.
- The United States retained its traditional reporting chain from the assigned Joint Task Force (JTF) in support of the relief operations up through PACOM.
- Ultimately, multiple chains of command operated simultaneously within the theater:
 - UN assigned the phase 2/3 mission which, by then, had wound down but was still in place.
 - U.S., through the JTF, assigned the recovery mission.
 - HN government, with responsibilities for governance, courts, and police.
 - HN military, working with the U.S. military but through its own chain of command, which differed from all of the above.
 - Multinational militaries still working through the UN chain of command.
 - Independent NGOs and Private Voluntary Organizations (PVOs).

As we discuss above, having these multiple chains of command made for a complex set of supported/supporting interactions. It also cross-indexed with the multi-faceted challenges presented to the medical planners during the game. In addition to blast/trauma battlefield casualties among all of the military forces and civilians that were occurring because of the insurgency, there were also issues of disease, medical services restoration, general medical relief (e.g., OB/GYN, surgery, etc.), and psychological counseling for the West Lemurian civilian population. Who was providing what, using which logistics train, would quickly become a challenge for the JLEnt.

The JLEnt concept accounts for this complexity in that it assumes that many, multi-layered organizations will be present in the area of operations. The situation is particularly challenging when multinational organizations and countries (e.g., the UN, the United States, and the host nation) all lay claim to independent or overlapping operating authorities. In that case, how does the JLEnt coordinate and prioritize responsibilities?

During the game, players attempted several different models to organize the disparate requirements and providers. One was a CMOC-like model, that entity was a U.S. construct that might not necessarily fit the overall model for the HN military. Likewise, the CMOC concept assumes that the U.S. military is providing transport and security as its services and the other actors are providing relief and aid.

According to doctrine—although it is less common in practice—the CMOC has several other responsibilities for advising the operational commander that the JLEnt does not have. In the JLEnt concept, it is possible for anyone to be providing any service—for example, an NGO could provide convoy transport—so that the traditional CMOC model may not apply.

Observation

The complexity of CEs will require that the JLEnt be capable of adapting to other relief C3 structures that may exist, often simultaneously. As the JLEnt envisions a networked environment of individual contacts, it will be important to identify those network nodes within other C3 nodes in the battlespace. Mapping those out will be an important first step in organizing and implementing a JLEnt.

The obvious choices for developing pre-conflict linkage points for the JLEnt would be the CMOC concept as well as the Logistics Cluster. Identifying a set of positions within the JLEnt that interface with these organizations, along with a battle rhythm and reporting process, would facilitate implementation of the JLEnt during the operation.

JLEnt operations as part of a MARO

Mass atrocity response operations (MARO) are a component of Joint Peacekeeping Operations doctrine [14].

In the game, we posited a CE combined with a failed state where the state had been brutalizing its citizens. While a notional geography was used, similar examples would be Darfur, Rwanda, and Cambodia under the Khmer Rouge [15]. Prior to the conflict, West Lemuria was running an extensive system of penal and political prisoner camps, where the prisoners were provided with limited food, water, sanitation, and shelter. The situation in the country of West Lemuria was dire for normal citizens; for citizens in the camps, it was critical. The camps ranged in size from 5000 to 10,000 prisoners.

Given the situation, the U.S. forces were given the mission to stabilize the camps regardless of other missions. This was made difficult by the demands of stabilization (food, water, sanitation, shelter); the presence of endemic disease, which could affect camp mortality rate; and the isolated location of the camps. In addition, the

remaining West Lemurian forces had largely abandoned the camps and there was no clear place to resettle the individuals if they left the camps.

These camps presented the following challenges to the players:

- Large at-need or at-risk populations
- Remote and isolated locations requiring rotary wing or off-road lift to access
- Highly stressed populations suffering from multiple challenges. Stabilizing the medical situation in the camps required not only medical personnel, but also preventative medicine, civil engineering, security, law enforcement, psychological counseling, and other services
- The potential for disease outbreaks
- Their potential high visibility posed the possibility that they would consume a disproportionate amount of response resources
- Camp condition documentation requirements (part of the MARO process)
- The need to manage the information environment surrounding the camps, both to prevent them from being seen as an aid delivery point (resulting in accumulation of additional individuals from the community) and to help reduce the threat to the victims.

In the game, players reacted to the requirements for medicines and medical support at these camps. The challenge was working with NGOs and PVOs who had established themselves at some of the camps, along with military medical personnel who had also been assigned there. Because the camps were isolated and the West Lemurian combat forces were still in the areas, the NGOs and PVOs had both security and transport challenges with the camps. The large number of victims who could not be relocated also affected the NGOs' ability to provide for the victims. The players faced the challenge of balancing the almost unlimited demand from the camps for medical resources with the other demands that were being placed on those resources by the general population and the coalition military forces.

The best solution in many cases was for the military to provide security and logistics lift into the camps, and focus the relief efforts on the NGOs.

However, medical logistics became only a small factor in the overall challenge in U.S. forces dealing with the camps. The HN forces were not sympathetic to the plight of most of the West Lemurians as they blamed them for the war and generally considered them with suspicion. At the same time, international pressure was quickly building to do something about the large populations in the internment camps, most of whom had no place to go if they were displaced from the camps.

In this case, the structure of the JLEnt worked in favor of U.S. military forces. Because the camps were a high visibility and critical item for U.S. forces, but not necessarily for the HN, the United States could use the JLEnt to source not only logistics but also medical and emergency support services for the camps without over-taxing their own resources.

The networked nature of the JLEnt also meant that it could be used to coordinate medical logistics across the area of operations. This allowed critical medicinal distribution to be balanced between the general population and the camps. Balancing medicinal distribution resources became important when the camps were identified as possible incubators for widespread outbreaks that risked becoming pandemic in the general population.

At the same time, the reluctance of the HN to participate in supporting the West Lemurian population in general and the camps in particular raises an interesting challenge for the JLEnt. In a MARO, some of the participants the U.S. military has to deal with may not be sympathetic or disposed towards the victims (e.g., a group may not want to appear in alliance with the U.S. military by providing aid) [14]. In these cases, the JLEnt will need to use its network structure to adapt to the hostile elements and identify elements of the JLEnt that will be willing to provide aid.

Observations

We can make the following observations from the scenario and game play:

- The JLEnt should consider how it adapts to an environment that includes a MARO. Are there unique linkages that need to be made with other organizations in a MARO that do not exist in a conventional CE?
- In a MARO, the motivations of the actors may be complicated toward the victims as they were in the game because of prejudices, fear of appearing sympathetic to U.S. intervention, and other reasons. How does the JLEnt account for different motivations and attitudes amongst the network? How does it route around key actors independently of potential command and control relationships? (For example, in the game, the HN government was “in charge” of restoration operations while U.S. forces were being told to provide aid to the camps. If the HN owned the JLEnt, how would U.S. forces route around HN intransigence to use the JLEnt?)
- Medically, the response required a combination of clinical (including gynecological and pediatric), pharmacological, preventative, and psychological response. How would the JLEnt source the wide range of requirements involved in a MARO response?

Medical logistics from the sea

The geography posited in the scenario presented unique challenges. Players essentially had to manage a CE within an island archipelago. This meant that each major region had different requirements, and that ground forces could not simply set up a convoy system to reach all parts of the country (as they did, for example, in Somalia). This kind of detached, dispersed geography presents significant logistical challenges for the JLEnt, and requires U.S. maritime forces to provide security and physical support to the enterprise.

Maritime Security

In the scenario, West Lemuria conventional forces had been defeated but independent commanders continued to resist in some areas. These commanders had access to small craft, MANPADs, RPGs, and ATGMs, along with small arms. This presented a continued, low-level threat to maritime forces. Connectors, LCACs, AAVs, LCUs, and riverine craft are especially vulnerable due to their small size, near-shore operations, and lack of self-defense capabilities.⁵

In a Joint Task Force operation, the JTF will designate one of his subordinate officers as the Joint Forces Maritime Component Commander (JFMCC). In the case of West Lemuria, the United States would have a JFMCC, who would work with the CFMCC (Coalition Forces Maritime Component Commander) to manage the maritime battlespace. Because coalition forces dominate the maritime battlespace, the role of the UN, NGOs, and PVOs is limited.

In the game, we assumed that the UN would bring in heavy shipping to East Lemurian ports in order to stage relief supplies. Small items and individuals would be transported by air, but bulk cargos and cargos needing to reach isolated areas (such as the internment camps) would need to go by sea.

Given the threat, the JFMCC would control movement and defense of connectors moving in the near-shore area. This would be part of the standard JTF C3 processes. However, the JLEnt would need to interface with the JFMCC in order to ensure that the non-military cargos were getting staged at the right locations, that connectors were available for movement, and that the connectors were travelling along defended routes.

⁵ LCAC: Landing Craft Air Cushioned. AAV: Assault Amphibious Vehicle. LCU: Landing Craft Utility.

Distributed logistics

Movement of logistics across the maritime domain complicates logistics because intermodal transfers need to occur, and some items may need to be staged onboard ships. This requirement is included in the broad category of sea-based logistics, in which items are managed from ships, either combatants or dedicated logistics ships and delivered by air or surface connectors [16]. Moving non-Naval logistics onto and off of ships can impose a set of requirements that is related to classes of logistics allowed on ships and various HERO (“Hazards of Electromagnetic Radiation to Ordnance”) constraints.

Moving material onto ships from other non-military providers may be even more problematic depending on what type of material is involved. The special constraints of using ships for logistics will need to be incorporated into JLEnt models if a sea-based logistics approach is going to be used.

In this scenario, the archipelagic nature of Lemuria made sea-based logistics a requirement. Many areas of West Lemuria were distant and isolated from any logical logistics hub, and some areas were not easily accessible by aircraft. This meant that logistics would flow into APODs in East Lemuria, be transported to staging areas either on the ground or at sea in West Lemuria, and then delivered by tactical connectors or convoys.

For sea-based logistics, this meant that the JFMCC logistics cell had to coordinate with the provider (UN, NGO, or USG), then the HN logistics train, and, finally, the joint military logistics system. The JLEnt could provide a networked communications tool only if the requirements of the JFMCC were understood prior to the operation.

This suggests that the JLEnt should attempt to incorporate JFMCC logistics systems, requirements, and sea-based operational concepts into its overall network organization.

Medical logistics from the sea

While the need for JFMCC/JLEnt coordination is important for sea-based logistics in this game, we were focused on medical logistics. Medical logistics did not strain the overall logistics system due to the small volume and weight requirements. The primary challenge was cold chain (i.e., the transportation of temperature sensitive products along a supply chain) and movement of larger equipment such as x-ray machines as part of recovery operations. While not played in detail in the game, some medical materials, such as radioactive elements, would need to meet naval material and packaging requirements before being brought onboard ships.

At the same time, ships have an organic medical capability that includes surgical and preventative medicine in the larger ships (hospital ships, amphibious ships, and

aircraft carriers). These capabilities can support medical operations ashore, but there are challenges. These include:

- Shipboard medical capabilities skew toward combat casualty and general medicine for a military population. Preventative medicine, civilian care, and disease response may not be as efficient if performed by ship personnel.
- Getting personnel and equipment from the ship, or patients to the ship, can create logistical, transport, and legal challenges. For example, moving personnel onto and off of the hospital ships can be a challenge due to limited landing space and small boat handling capabilities [17].
- Coordinating operations ashore can be challenging because of communications limitations. While the ships have robust communications suites, the areas ashore in need of support may not. In addition, doctors and equipment need ashore transport once they get ashore, and logistics in support of their operations. These capabilities may not be available in the areas where they are needed, or may require shore parties to provide coordination [17].

In this scenario, it quickly became apparent that for the JLEnt to succeed in coordinating medical capabilities from the sea base, it would need to be integrated into JFMCC medical operations and incorporate an understanding of the capabilities of ships to provide medical support ashore. This requires that the JLEnt, or whatever joint provider is requesting the services, coordinate both the medical operations as well as the supporting logistics, security, and transport operations.

Observations

We can make two observations based on the scenario as posited and player actions:

- The JLEnt may need to incorporate JFMCC operations in order to manage connectors in a scenario that involves a maritime threat. A “CMOC from the sea” may be required to establish an overall security and transport coordination mechanism across the U.S., coalition, and partner nation JFMCCs, along with the UN WHO and NGOs that may have maritime capabilities in the AOR.
- Sea-based maritime logistics will complicate the JLEnt. Sea-based operations impose their own set of requirements on material that will flow onto and off of ships. The JLEnt will need to plan, train, and rehearse operating in the context of sea-based operations to include the management of movement of logistics onto and off of ships and the routing of logistics across connectors.
- Medical capabilities available on ships can pose some unique challenges of getting doctors to patients or patients to doctors. In a networked environment,

the JLEnt planners will need to consider how to use afloat medical capabilities and how those capabilities will integrate with ashore operations.

Joint medical operations and the JLEnt

Medical logistics was one of two areas of focus for the game. Aircraft parts and maintenance was the other. In the analysis leading up to the game and during game play, several issues were raised with respect to how medical logistics will integrate with the overall JLEnt concept. These include:

- Military support for own force and coalition force medical requirements.
- Integration of JLEnt logistics support to civilian infrastructure that supports military own and coalition force medical logistics.
- Integration of JLEnt with host nation medical support during a CE.
- JLEnt coordination with disease reporting, prevention, and treatment.
- Categorization of medical missions both for own forces as well as the population. In other words, there are a variety of tasks from preventative medicine to battlefield surgical trauma that need to be addressed. How do those various requirements integrate into a 'whole-of-enterprise' concept?

In this section, we divide the various requirements into three general areas:

- Military medical and the JLEnt
- Patient management
- Medical tasks and JLEnt integration.

Military medical and the JLEnt

An important consideration for JLEnt medical operations is the distinction between medical logistics support for U.S. forces and support by U.S. forces. In the game, it was repeatedly pointed out that U.S. military medical capability is sized, equipped, staffed, and focused on treating military personnel and combat casualties. As has been seen in other medical response operations, this does not routinely transfer to provision of civilian medical services to others [18].

In the game, this was further complicated by the lack of capability and capacity on the part of the partner nation: East Lemuria, requiring that some of its forces be serviced by U.S. medical capabilities. East Lemurian assets were also in demand in

support of the West Lemurian civilian population, further draining their ability to service their own troops.

The drain on capacity from coalition requirements and own force combat casualties produced an interesting situation for the JLEnt. In addition to supporting the main humanitarian effort in West Lemuria, they were also supporting U.S. logistics requirements and some of East Lemuria's logistics requirements. In a situation where one of the coalition or partner nation's medical logistics capabilities is insufficient to meet the demand caused by combat casualties, what is the role of the JLEnt in managing conventional military logistics?

Within the U.S. system, the Defense Medical Logistics Standard Support (DMSS) system is designed to provide for management of DoD medical logistics. It will be integrated into the Joint Operational Medicine Information Systems (JOMIS) along with patient tracking and other software. How DMSS integrates into the JLEnt, both in terms of drawing from coalition force stocks and in replenishing coalition force stocks, would have been important in this scenario.

Patient management

One area that the JLEnt does not address directly, but with which it may need to integrate, is the medical casualty management system. Medical service provision and casualty management is generally included as part of the joint medical enterprise, but it draws on logistics capacities and has many similar requirements for patient, bed, and capacity management as the JLEnt.

For example, a corps level MTF becomes overloaded but is close enough to the border with the HN (East Lemuria in this case) to utilize some of the rear-area domestic hospital capability to off-load those patients who do not need to immediately be medevac'd to a theater level asset. In this case, the JLEnt will need to integrate with existing military medical tracking and patient management processes and software. However, it may allow the expansion of the overall capacity of the medical system in situations where it is becoming overwhelmed.

Another example was the integration of the military medical capability with existing HN, participating nation (PN), or local medical facilities. In the game, HN and PN forces had medical facilities, as did the local economy. The movement of some capabilities from exclusively U.S. force provision to a network provider capability might increase the overall availability and accessibility of those capabilities to forward forces. In the game, this was reflected in discussions of radiological capabilities being provided to the West Lemurian civil facilities as well as the existing but underutilized capability at the East Lemurian forward treatment facilities.

While military medical capabilities are preferred as a source of both logistics and patient treatment, capacity issues can overwhelm the system and require

coordination with HN or PN hospitals and medical facilities. Treatment of routine issues at these facilities can free up medical evacuation and CONUS-based capacity for the more serious cases. How, where, and in what format the JLEnt integrates with the overall medical casualty and capability management system is an issue that arose from this scenario and one that affects JLEnt planning.

The Joint U.S. medical system has the ability to manage casualties within our own casualty treatment system through electronic health records (EHRs) in the Theater Medical Information Program - Joint (TMIP-J) and the modernized version of TMIP-J, the Joint Operational Medicine Information Systems Program (JOMIS). These systems allow for EHRs and patient tracking through the Joint Medical System. The EHR as specified in the JOMIS is designed to be compatible with other EHR systems, including civilian systems [19].

Casualty movement for DoD is a function of the Joint Medical System; however, if it is conducted in conjunction with other organizations outside of DoD (based on capabilities and demand), then it will need to integrate with EHR and JOMIS C3 and information requirements. Likewise, these systems will need to accommodate JLEnt requirements in the same way they handle non-U.S. military patient records and accounting.

Medical tasks and the JLEnt

Medical logistics requirements in the game were a diverse set of challenges. These included:

- **Food, shelter, and clean water.** As the game progressed, the overall situation in West Lemuria became increasingly challenging due to lack of basic infrastructure and life support material. This further challenged medical and linked infrastructure to medical.
- **Disease treatment and prevention.** Disease was a threat in all regions. This required both preventive care and treatment. This was the primary draw on non-military logistics: the provision and movement of disease treatment measures (vaccines and antibiotics).
- **Civilian population trauma and combat casualty care.** As the remnants of the West Lemurian military were actively targeting civilians, there were many cases of trauma and other combat-related casualties among the general population.
- **General civilian medical requirements.** In addition to disease and combat-related casualties, the West Lemurian population had a typical set of medical requirements for a population the size of West Lemuria. The most frequent presentations included broken limbs, OB/GYN, and chronic diseases such as cancer or heart disease.

This gave the JLEnt a wide variety of medical logistics requirements to collect, process, and fill. The security environment meant that any logistics delivery would need protection and movement by military forces, requiring the JLEnt to work much like a CMOC to facilitate civil/military/HN coordination.

Medical logistics imposed some unique requirements on the JLEnt. Preventative medicine involves not only the delivery of material but also the provision of water, food, shelter, and infrastructure repair. Without addressing the underlying causes or vectors of the disease, efforts to treat will only increase with time. This expands the scope of the JLEnt, much like the scope is expanded when medical casualty management is involved in joint military/HN/civilian operations. Here the JLEnt may be called on to coordinate repair or infrastructure support operations, whether general construction or specific medical infrastructure repair.

Another unique requirement was the preservation of the cold chain for certain treatment products. This ranges from vaccines and antibiotics to blood and plasma and other products. While the military logistics chain for blood and plasma is well defined and coordinated, crossing the interface between the military system and the HN/PN/civilian system can be fraught with authorities, regulations, and process differences.

In a recovery operation such as the one in the game, the areas of conducting relief operations, stopping the initial casualties, and assisting with recovery efforts can all blend together. Given that conflict was ongoing, there was always the potential that remnants of the West Lemurian military and governmental forces would increase the risk to civilian populations even after they were stabilized. Mission creep, or mission leap, is always seen as a risk in these environments. The JLEnt will be at the edge of mission creep because it will be one of the primary ways that all parties—civilian/HN/military—communicate their requirements to each other.

How the JLEnt feeds and manages emerging requirements will be important if the U.S. military wants to avoid mission creep in a CE. Even if regular forces manage to avoid creep, the role of the JLEnt as the primary coordinating mechanism may place the U.S. military in the central role as logistics and support coordinator for the operation. This may increase the difficulty of disentangling U.S. forces from the operation.

Observations

Military medical capabilities, whether one's own force or partner nation, are focused on treating combat casualties and providing general care to military forces. They are not typically equipped to provide emergency medical care in a disaster or CE. However, the JLEnt can also network military medical requirements with those of the PN, other military forces, or even the NGO/PVO capabilities being provided to the

victims. These capabilities may allow for an increase in combat casualty treatment in expedient circumstances.

In some cases, the best capability the military brings to the medical problem is stabilization and material provision to other medical treatment capabilities. If the military medical is responsible for and focused on combat casualties, it may not play a substantial role in the provision of medical care to the civilian population.

Coalition forces may not have robust medical logistics or combat casualty management. This raises several questions:

- How does the JLEnt relate to the Joint Force Medical operational concept? Does the JLEnt integrate only with medical logistics or does it have a role in patient management that might occur outside of the Joint Medical system?
- If the JLEnt has a role in coalition or civilian casualty management, does the JLEnt need to interface with various C3 capabilities for casualty management?
- How does the JLEnt integrate with the DMSS given that the DMSS already has insight into civilian and other medical logistics provider inventories and capabilities?
- Does the JLEnt expand the DMSS, provide DMSS capabilities to other partners, or focus on providing a means of distribution instead of acquisition?

HN and coalition forces may place a further drain on U.S. military medical capacity. In configuring the JLEnt, the provision of military-to-military and civilian-to-military medical care and resources (such as hospital beds) may be a bigger consideration than enabling NGO and PVO medical care for civilians.

The role of the JLEnt as a coordinator between civilian/HN/military operations places U.S. forces at risk for mission creep by entangling them in both relief and recovery operations during a CE.

LOGWAR-15 observations

Synthesis of the data collected during LOGWAR-15 highlighted a range of chronic issues, including: stakeholder desire for a common logistical language to improve visibility into the available resources, improved understanding of the legal complexities associated with sourcing from various providers, and having an adaptable and pervasive system for tracking both resources and requests.

In addition, the game revealed three distinct but related capstone findings, each of which we explore in detail below:

- The importance of fully defining the mission
- The need to have a process that can generate a resilient, integrated governance framework adapted to the demands of the immediate environment
- The importance of maintaining an equality of standing among the contributors to the JLEnt concept.

Addressing these issues will support the Joint Staff's initial goals to be more interoperable and prepare for increasingly complex situations. Furthermore, addressing these issues will enable a more collaborative environment, which is key to developing trust and the sharing of requirements and capabilities.

Mission Definition

Absent the explicit inclusion of broader strategic objectives in mission tasking, the JLEnt construct provides no value to operations. If supporting other major actors within the logistical response and empowering the redefinition and sharing of capabilities to insure that they also accomplish their mission is not explicitly authorized, each group will carefully manage the scope of their responsibility so as to maximize the impact of their internal, but isolated, support. This disables the possibility of identifying alternative approaches and using external capabilities and resources, which might lead to collaborative solutions that have far-reaching impacts.

However, if each of the groups associated with a logistical response were able to infuse the broad strategic objectives of the entire community into their mission tasking, the result would be a collaborative and coordinated response that allows for significant increases in speed of response and overall efficacy.

While this observation was most succinctly and directly put forth by DoD participants, all of the organizations represented at LOGWAR-15 shared this view. The groups noted that they are currently restricted from collaborating with each other because their missions are not defined to allow it. Thus, while they noted that capabilities that one group needed were often available from the other, they also highlighted that they could not use them. For example, while nongovernmental organizations (NGOs) identified a critical need for broad, overall physical security within the area of operations, they also noted that working with a group conducting military operations carried potentially significant negative baggage. Similarly, the DoD group expressed a need to have a better understanding of the nuances of the local environment (both political and physical), but also underlined the restrictions against working with organizations that might have ties to adversaries.

However, as several groups pointed out, the JLEnt framework is not so much a physical or organizational construct as it is a model of behavior. As noted previously,

the participants were able to point to examples of extensive collaboration and coordination at the strategic level, and there was consensus that, at the extreme tactical level, it is assumed individuals will do what needs to get done.

While there was a general consensus that the extensive collaboration represented by the JLEnt approach seemed no different than their current practice on the ground, the participants frequently were unable to productively interact (both during the event and in real life) and highlighted all of the obstacles, such as third-party expectations and disabling regulations, that they perceived were insurmountable and were preventing them from collaborating and coordinating.

It is likely that some of this friction arises from stovepipes within the intermediate layers of the logistical support structure. Many of these layers (even within DoD) are isolated from each other; the participants noted that, for many of them, LOGWAR-15 was the first time that they had met. While the participants were initially seated by group, they were encouraged to interact and move between the various elements; however, only the U.S. Transportation Command (TRANSCOM) participants routinely did so. This suggests a significant habit of mind that preserved the segregation of the various groups during the game.

When the participants broke into smaller groups in adjoining rooms, this effect was even more pronounced. As representatives from TRANSCOM demonstrated, however, these perceived barriers were relatively easy to overcome. By actively circulating between the various groups, the TRANSCOM representatives served as couriers of information laterally across the JLEnt construct, and many participants commented positively on the impact of such efforts.

In the end, the potential success of the JLEnt concept hinges on the creation of policy that enables the various groups to interact and to be physically collocated with the various logistical actors.

Framework for Integration

Another major issue that emerged from LOGWAR-15 was a lack of a viable organizational framework. During the final planning conference, the participating commands developed a nominal organizational hierarchy, and assigned the event participants to various roles. However, during play on the second day—after acknowledging the issues with mission definition—the DoD group spent a significant amount of time redesigning its organizational structure, which produced an organization built along the traditional lines of a command-and-control construct. By contrast, the non-DoD groups generally were loose confederations of disparate organizations that lacked an agreed-upon focal point with decision authority.

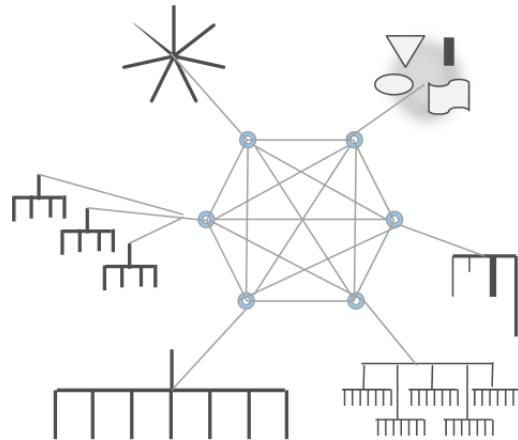
Such disparate modes of organization left no ready means of formal communication among the groups. Although the TRANSCOM representatives continued to circulate, generating situational awareness among the participants, this did not create an effective forum for raising and addressing issues. In addition, this lack of common structure for governance also greatly reduced the participants' ability to flexibly interact by forcing all substantive discussions to higher levels of authority.

Ultimately, even though the participants offered potential models that were drawn from their past experiences, they were unable to establish internal governance for the wider group that satisfactorily empowered them all. This, in turn, prevented them from effectively prioritizing their activities.

It was clear that the organizational structure of the JLEnt concept needs to be able to accommodate the integration of widely disparate organizational constructs drawn from unique histories and motivating factors. While the DoD participants were comfortable with a classical, hierarchical, command-and-control structure, the NGO participants noted that it would be nearly impossible for them to exist within a similar construct. Similarly, the industry cell representatives stressed that internal competition among its members would pose a significant impediment to effectively organizing hierarchically.

From a networking perspective, a JLEnt-oriented response needs to first identify the nodes and hubs across and within the various organizations. Once these nodes within the networks have been identified, each organization's leadership needs to be encouraged to invest some of their political capital supporting these bridges between organizations. This investiture can be achieved by targeted staffing choices, selecting individuals experienced in the JLEnt approach and empowering them to act autonomously. The personnel in these nodes then serve as linkages, reducing the distances between different elements of the logistical response, thus increasing visibility and speed of response. Figure 4 gives a qualitative representation of how organizations with disparate hierarchies could be drawn together into a single cohesive JLEnt response.

Figure 4. Conceptual organization of a JLEnt approach to governance



One possibility for addressing this issue is to work toward a confederation of actors, with each recognized as the leader of a particular subspecialty. This is similar to the United Nations Logistics Cluster approach.⁶ In this mode, the various subspecialties form a mutually supporting collaboration rather than the supporting-supported hierarchy that is more familiar to the U.S. military.

Equality of Standing

A final major observation from LOGWAR-15 was highlighted by the relative number of participants attending from each of the groups. DoD's robust representation frequently led to these participants setting the agenda and driving the discussions. This sometimes led to closing off avenues of collaboration across the assembled group.

This underscores a perceived inequality in the status of the various participating organizations in the JLEnt. If the JLEnt is to be a truly collaborative effort, then there will be instances when the roles of supporting and supported organizations will switch. This may require organizations to support other entities that might have less authority outside the JLEnt, (e.g. The DoD supporting Doctors Without Borders). In LOGWAR-15 this perception of not all groups being equal manifested itself when several of the non-DoD groups believed their concerns and equities were being

⁶ The United Nations Logistics Cluster is a confederation of humanitarian organizations, led by the World Food Program, that work together to provide logistic response to humanitarian assistance and disaster response contingencies [13].

marginalized due to their size or the “political capital” they wielded in real-world. A fact that several participants stated was not uncommon in real-world operations.

This lopsided dynamic poses a risk to the JLEnt construct. Minimizing partner organizations will terminate any incentive for collaboration. This risks resources and capabilities of smaller and less powerful organizations to be underutilized if groups do not feel they have a voice that is heard and respected.

Prospective from Senior Leader participants

In addition to the themes presented above, there were a set of topics that were discussed during the Senior Leader session that occurred on July 23, 2015, immediately following the execution of the LOGWAR-15 event.

The most prominent of these was the identification of the LOGWAR game series as a means to knit together the disparate elements of the larger JLEnt community of interest. The participants noted that increasing the interaction within the enterprise would improve the overall awareness of the available capabilities as well as mitigating the competition for resources; both of these have been long standing issues in the logistical community [3].

Another oft cited possibility was using LOGWAR as a vehicle for propagating and sustaining current best practices within the next generation of logisticians. The participants felt that LOGWAR could be used as a seminal component of the training regimen and be made available to the entire JLEnt community. This would also help foster whole-of-government approaches to complex emergencies and provide a framework for rapid response to and management of multiple crises.

As in previous works [3-5, 8, 20], the participants highlighted several chronic issues. Foremost among these were barriers to communication. The participants specifically noted that the lack of a common lexicon and the classification of DoD’s entire component of the logistical response created nearly insurmountable obstacles to efficient and timely responses. Protecting local economies, outdated procurement guidelines, and a lack of sufficient maritime transport were also identified as ongoing issues of concern.

Finally, the non-DoD participants noted that, while they often had unique capabilities, the depth of the support that they could provide was often somewhat limited. This did not decrease their interest in participating but did suggest that some of the most important things DoD could contribute were access to and sharing of key enablers such as lift.

A more lengthy description of the discussion during the Senior Leader roundtable can be found in Appendix E [11].

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Conclusion

Summary of findings

The key elements for the successful implementation of the JLEnt concept are ensuring that:

- The mission is defined such that the authority to collaborate is pervasive at the operational level
- The organizational structure is adaptable enough to accommodate substructures with widely disparate hierarchies (or even the lack of hierarchy)
- Each group maintains an equality of standing within the overall resultant network of relationships.
- If U.S. military plays a central role in logistics and support coordinator for the JLEnt, it may find it increasingly difficult to disentangle U.S. forces from the operation.
- There is an overall unawareness of available capabilities of participating organizations and a way to mitigate competition of resources
- The acceptance of the networked concept for managing inter-organizational logistics will need to occur both when the United States is in charge and when the United States is integrated into a coalition response.
- In the future, integrate operational forces into the JLEnt concept to allow two-way provision of combat resources and logistics.
- Barriers in communication such as lack of common lexicon and DoD classification need to be overcome to ensure coordination with all JLEnt organizations

To enable success in these areas, the participants noted that a critical capability is to maintain a deep bench in each organization of personnel capable of connecting to a framework developed using the JLEnt approach. They felt that the personal connections they would develop through participation in events such as LOGWAR-15

would help to establish and maintain their ability to effectively coordinate and collaborate.

Next Steps

LOGWAR-15 is the initial step in a campaign effort to better understand the issues of the Joint Logistics Enterprise and develop plausible solutions. The LOGWAR series⁷ will continue to explore the JLEnt concept over the next few years, with increasing depth and complexity. The intent is to hold a game every two years, with the next ones in 2017 and 2019. The goal for the 2019 event is to have three distinct, but integrated, scenarios centered on the three likely primary actors, depending on the nature and location of the contingency: the Department of Defense, the Federal Emergency Management Agency, and the World Food Program.

To this end, the current plan is to expand the construct used for LOGWAR-15 by further developing the CONUS component of the scenario to allow for active play and to include another contingency modeled on a Humanitarian Assistance and Disaster Relief (HADR) event located in either the Pacific or European theater. LOGWAR-15 helped define the landscape of issues with the JLEnt. The goals is to now work to implement new approaches developed from the insights obtained during LOGWAR-15 and to create an environment to further develop and debug the interactions and network structures imagined in the JLEnt concept.

In support of this development path, and to reach the next incremental step of AGILE-17, we recommend the following actions:

- Document and further articulate the long-term issues identified by the LOGWAR-15 participants. This will help to maintain a dynamic outline for game and scenario development.
- Compare and contrast past crisis responses through the lens of social networking. Discover what, if any, themes may exist to build a better understanding for a more idealized JLEnt framework. This will help to develop the tools made available to game players for future LOGWAR events.

⁷ The LOGWAR series has been renamed AGILE (Advancing Global Integrated Logistics Effort). For the purpose of this report, the campaign will still be referred to as LOGWAR, but any subsequent reports will refer to it by the new AGILE moniker. For example the future wargames slated for 2017 and 2019 will have the name AGILE-17 and AGILE-19, respectively

- Conduct a workshop with actors associated with homeland response to provide more detail regarding the CONUS aspect of the scenario.
- Conduct a workshop with actors associated with an international response to provide more detail regarding the OCONUS HADR aspect of the scenario. For LOGWAR-17, while this component of the event will likely be scripted and relatively circumscribed, it will be important to begin developing the linkages and feedback loops to allow for the detailed execution imagined for LOGWAR-19.

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Appendix A: Medical Materiel

This appendix to the Joint Staff J-4 LOGWAR-15: Gamebook explains the process by which CNA structured the medical logistics focus for LOGWAR-15 and details the support that event designers received from subject matter experts.

Introduction

What is Class VIII medical materiel?

Class VIII includes all medical materiel, including equipment, supplies, and consumables. Class VIII materiel is divided into two categories:

- **Class VIIIa** (the bulk of Class VIII products) includes “pharmaceutical, medical-surgical, dental, medical laboratory, radiology, and optometry supplies; as well as preventive medicine items and medical equipment.”⁸ It also includes repair parts specific to medical technologies.
- **Class VIIIb** includes only blood and blood products.

Why focus on medical logistics?

The Joint Staff J-4 chose medical materiel as a focus for LOGWAR-15, as medical logistics provide an avenue to explore multiple challenges within the Joint Logistics Enterprise (JLEnt) approach, particularly friction points across partners that can be extrapolated to other areas. In other words, medical logistics provide a unique, crosscutting vehicle for exploring the value of the JLEnt process.

Unlike ordnance, ammunition, or repair parts, Class VIII materiel is ubiquitous across partners and stages of conflict. All JLEnt partners—including U.S. Department of Defense (DoD) partners, coalition forces, international organizations (IOs), and

⁸ Source: DoD Directive 5101.9, August 23, 2004.

nongovernmental organizations (NGOs)—need medical materiel. It is necessary in all stages of engagement, including during long-term sustainment operations. Because of this pervasiveness, CNA and the J-4 thought that a medical logistics focus might encourage the involvement of non-DoD actors, who might not otherwise participate.

In addition, because all partners use medical materiel, different sectors (DoD, NGOs, Foreign Governments, etc.) frequently compete against one another to obtain limited amounts of Class VIII materiel. Better coordination of Class VIII materiel could save lives and money, and could help to accomplish American and coalition military—as well as political—goals. Importantly, this focus also aligned with one of J-4's goals to improve interoperability of medical care among DoD partners.⁹

Medical logistics are heterogeneous enough to highlight multiple challenges within a single class of materiel, including transportation, storage, procurement, retrograde issues, and maintenance. These areas are not unique to this class of materiel; for example, some medical items may have limited shelf lives, or may require special storage, but the same is true of items in other classes of materiel.

To ensure that LOGWAR-15 highlighted potential weaknesses and flaws in the current JLEnt system, and to fully engage participants, CNA interviewed stakeholders on:

- The current state of/processes for obtaining and sharing Class VIIIa materiel;
- Items that would exercise the processes of the JLEnt more broadly; and
- Estimations of supply and demand for materiel.

Below, we discuss our process and findings in more detail.

Historical modes of operation

CNA staff held semi-structured interviews with a variety of stakeholders, including Joint Staff J-4 medical logisticians, medical logisticians and planners from each of the Services, and sources from U.S. Transportation Command (TRANSCOM) and the Defense Logistics Agency (DLA). Interviewees were asked about what medical assets they deploy to the field, as well as what Class VIIIa materiel they transport and use. In addition, they were asked about how they transport Class VIIIa materiel and in what ways they work within and outside of DoD to jointly manage logistical and

⁹ Source: *Joint Staff J-4 2014 Annual Guidance*.

operational medical assets. Finally, interviewees were asked about the current challenges in working within the JLEnt. For LOGWAR-15, the majority of our data collection revolved around the Services.

The Services supply their own materiel.

Subject matter experts (SMEs) report that Title X means that the Services are responsible for procuring and maintaining their own medical materiel. Therefore, despite the J-4's push to increase joint medical logistics, the Services feel that this is something that each of them must do separately. The Services also estimate the amount of needed medical materiel separately. These estimates should be based on intelligence, but often are simply reproduced from a generic threat assessment and rarely change across years and geography. The "standard package" approach can be a major problem if a specific piece of materiel is needed that was not initially planned for (e.g., when conditions on the ground are different from the intelligence received, or when conditions are novel and require specialized equipment, such as during the Ebola outbreak).

DLA is the executive agent for medical materiel.

After the Services estimate their needed medical materiel, they each provide a yearly estimate to DLA. This list can be updated as the situation on the ground or intelligence changes. Based on demand estimates from the Services, DLA sources the materiel through Prime Vendor contracts with civilian manufacturers. For medical materiel, there are a limited number of Prime Vendors, which are generally medical suppliers, not manufacturers.

The Theater Lead Agent for Medical Materiel (TLAMM) orders and stockpiles medical materiel.

In the field, medical logisticians generally order medical materiel using a joint online ordering system, the Defense Medical Logistics Standard Support's Customer Assistance Module (DCAM). When ordering specialized materiel not included in DCAM, logisticians and planners usually look to the TLAMM, then to Kelly USA (the Southern Command TLAMM, operated by the U.S. Air Force). If they cannot get the materiel they are looking for, they will next call professional contacts in other TLAMMs or even Military Treatment Facilities in the contiguous United States.

Medical materiel procurements are generally low-volume and low-frequency. Nearly all medical materiel is supplied primarily through Prime Vendor contracts with civilian manufacturers. Materiel is shipped commercially (e.g., by FedEx) from the

Prime Vendor (e.g., Cardinal)—a medical supplier in the United States—to the medical logistician at the TLAMM, who distributes it to the units in need.

Interviewees also reported that most materiel is available from the TLAMM, and that it is rare for materiel to be difficult to source.¹⁰

Currently, JLEnt operates on an ad hoc basis in sharing Class VIIa materiel.

Interviewees consistently stated that sharing materiel with the U.S. Department of State (DOS) is somewhat common, but that sharing with host nations and IOs/NGOs is rare. At this time, sharing with non-DoD partners requires an instruction from a higher authority, generally DOS. These instructions require the development of memoranda of understanding, which the command or region produce locally and which take time to develop. Interviewees noted that if a partner organization has a small, one-time request, planners and logisticians will figure out how to fulfill the request on an ad hoc basis.

Medical planners and logisticians also reported that in joint efforts with other JLEnt partners, DoD primarily provides stability operations and transportation. However, every planner that we met with described a unique scenario in which DoD was asked to provide medical supplies and care to non-DoD actors (e.g., providing and transporting materiel to the government of Iraq, based on instruction from DOS).

Many challenges arise when sharing Class VIIa materiel across the JLEnt.

Sources in DoD identified several common, known challenges in sharing Class VIIa materiel, including:

- Understanding who has command and control, and who is defining the materiel requirement;
- Lacking accurate intelligence and analysis while estimating materiel requirements;
- Recognizing that IOs/NGOs are often hesitant to partner with DoD;

¹⁰ Examples of things that are difficult to source include new technologies or new requirements (e.g., intelligence or changing ground situations), which could generate shortages.

- Lacking knowledge about partner capabilities;
- Communicating effectively with partners, due to incompatibilities among systems or difficulties with remote or forward units; and
- Recognizing cultural differences, even between the Services.

These challenges are not unique to this class of materiel, but rather to JLEnt processes as a whole.

Identifying appropriate materiel for LOGWAR-15

After learning how the Services identify requirements for medical materiel and obtain the necessary supplies, we focused our efforts on identifying appropriate materiel for LOGWAR-15. We wanted to identify items that:

- Were functionally important;
- Were representative of crosscutting types of requirements beyond Class VIIIa materiel;
- Had varying degrees of mobility (i.e., some easy to transport, others more difficult); and
- Presented problems of moderate intrinsic complexity (i.e., neither easy solutions, nor impossible tasks).

CNA developed a list of potentially appropriate items for game play, which initially included over 100 items. Using this list, we consulted medical logisticians and planners from the Joint Staff, the Services, DLA, and TRANSCOM to identify four appropriate examples that highlighted various issues encountered in JLEnt transactions. This process included examining lists from two of the TLAMMs and a list from DLA of the most frequently requested Class VIIIa items. We also analyzed the major challenges that each item on the draft list might invoke. One of the goals of paring down the list was to ensure that each item represented different challenges that might be encountered in a real-world situation.

At the beginning of the planning process, some stakeholders were particularly interested in focusing on blood (Class VIIIb) as one of the commodities. Initial interviews supported this line of inquiry, as blood is one of the few commodities that medical planners worried about getting. It has strict sourcing requirements, a short shelf life, and specific requirements for transport and storage. However, the DoD

supply chain for blood is unique. Army is the executive agent for blood and administers a joint program to provide blood and blood products to the other Services through the Armed Services Blood Program. At this time, the various stakeholders had little interest in exercising the JLEnt to more effectively meet Class VIIIb requirements, and there is not an excess amount of blood such that sharing it with other JLEnt partners is realistic.

After several rounds of discussion, the list was narrowed to four items that represent crosscutting requirements for a variety of actors:

- Intravenous (IV) solution
- Antibiotics
- Scanning technology (especially x-ray machine parts)
- Personal protective equipment.

The next section of this appendix discusses each commodity in more depth, including its characteristics and distribution patterns.

IV solution

There are several kinds of IV solution, but the most common is simple saline solution (sodium chloride dissolved in water). Other types of IV solution include Lactated Ringer's and dextrose 5 percent in water. A patient's characteristics and the reason for use determine the type of IV solution chosen.

Both forward medical teams (including medics) and higher levels of care use IV solution. It is important in shock/dehydration situations in the field and is used in nearly every surgery.

The Joint Staff J-4 mentioned IV solution as a potential item of interest because of associated challenges. For instance, there is a current global shortage in both military and civilian contexts¹¹. In the United States, only three major manufacturers produce the most

General Characteristics of IV Solution

- Small in size
- Broad functionality
- Widely used by many actors
- Large quantities needed
- Limited supply
- Specialized handling and storage requirements
- Limited shelf life
- Contamination concerns
- Restrictions on sourcing

¹¹ Source: Fry, Erica. 2015. There's a national shortage of saline solution. Yeah, we're talking salt water. Huh? *Fortune*. 20 September 2015.

<http://fortune.com/2015/02/05/theres-a-national-shortage-of-saline/>.

common types of IV solution; substitutes are possible but require additional knowledge and may increase patient risk. Furthermore, it is likely that backup supply is double-counted within DoD and across civilian and government partners. Adding to the challenges, IV solution has a limited ideal amount of time for use, although sources stated that expired saline was frequently used in Iraq. In addition, recalls have happened in the past for potentially compromised batches of solution. Finally, many other JLEnt partners will require IV solution through similar distribution channels.

Antibiotics

Antibiotics are used as an antidote against infections caused by bacteria, including weaponized bacteria used in a biological attack (e.g., anthrax). There are many classes of antibiotics, and though some types of bacteria respond to a wide range of antibiotics, others can only be combatted by limited types of antibiotics.

General Characteristics of Antibiotics

- Small in size
- Easy to transport
- Multiple variants with limited interchangeability
- Require advanced training to use
- Often limited supply
- Specialized handling and storage requirements
- Restrictions on sourcing
- Potential single-point failure

Antibiotics can be administered orally, intravenously, and topically, depending on the location of the bacteria and severity of the infection. Regardless of the administration route, antibiotics are small and relatively easy to transport. Most are fairly robust to climate conditions, but interviewees reported that the extreme heat and humidity in Iraq led to denatured (unusable) antibiotics. In addition, antibiotic effectiveness can vary by geographic region. In some regions, there is more antibiotic resistance than others, so

understanding local bacteria is important in identifying which antibiotics should be used.

Some antibiotics are produced by several manufacturers, but others are produced by only a single manufacturer. Many antibiotics are included in the Strategic National Stockpile and are often stockpiled by the TLAMMs. However, other actors (e.g., host nations) may not have reserves.

Scanning technology (including x-rays)

Scanning technology allows medical professionals to create diagnostic images to assist in the treatment of patients. This technology includes (but is not limited to) x-ray scanners, magnetic resonance imaging scanners; and computed tomography scanners. They are generally only found in hospital settings in the field. Portable

x-rays are an exception; these smaller, less-sensitive machines can be used in more forward settings.

These machines are essential for accurately diagnosing injuries, but interviewees noted that once such technologies are set up, they are difficult to move. In addition, they can be sensitive to the environment (e.g., humid climates can lead to degradation). Therefore, it may make sense to leave a machine in the host nation after troops leave.

Another major challenge with scanning technology is the repair and replacement of systems. Systems take a long time to be built and generally cannot be purchased “off the shelf.” Furthermore, repair of these complicated systems pose challenges. Though the Services have staff designated to repair medical materiel, these machines require specialized knowledge. Most often, the manufacturer of the machines sends a technician to repair the machine in the field. Getting technicians to the hospitals can be difficult, as is getting specialized parts to the hospitals. The repair parts are often fragile and expensive, take time to produce, and require specialized knowledge for installation.

General Characteristics of Scanning Technology

- Moderate size
- Fragile
- Limited supply
- Generic utility
- Widely used
- Expensive and difficult to repair
- Issues with retrograding
- Requires extensive training to use

Personal protective equipment (PPE)

PPE is used to protect against daily environmental hazards, disease, and chemical and biological weapons. They can be as simple as a paper mask and gloves, or as complicated as an entire Tyvek suit.

General Characteristics of PPE

- Some stockpiling
- Limited production and supply
- Topically used by many actors
- Uncertain utility but highly desired (requirements are often unclear)
- Competition between JLEnt partners
- Potential single-point failure

While PPE does not technically fall under Class VIIa materiel, subject matter experts were excited to include it in LOGWAR-15, as the Ebola crisis was well underway when planning for the game began. During the crisis, medical planners and logisticians in West Africa and beyond were tasked with procuring appropriate PPE.

As mentioned previously, in novel situations (like many of those that require PPE), one of the major challenges for medical planners is the identification of the appropriate level of PPE. Defining the requirement is important for ensuring that the right materials are ordered, and for estimating the future supply.

Estimating demand to create realistic scenarios

With help from DLA Troop Support, we used the Medical Contingency Requirements Workflow (MCRW) tool to estimate demand and available supply of Class VIIA items for each scenario. We looked into using the Joint Medical Planning Tool, but it was not feasible for use in LOGWAR-15. MCRW requires only basic input from planners (little clinical input) and is designed to provide medical supply requirements for non-combat situations (e.g., disaster relief and humanitarian assistance).

MCRW is a web-based tool that generates expendable and durable Class VIIA requirements from tailored scenario inputs. CNA provided details about the affected and supported populations based on the developed scenarios. We input each scenario separately and ran different programs to estimate U.S. and Lemurian materiel requirements. Although a variety of datasets are available to tailor estimates to scenarios, we primarily used the Urban Patient Condition Occurrence Frequency tables,¹² which are based on data from the First Battle of Fallujah.

MCRW identified the needed materiel for each scenario separately, providing CNA with a National Stock Number (NSN)-based list of requirements associated with commercially based items. The output from the tool provides both raw tons of materiel required, as well as specific amounts of materiel. In addition, it compares the expected materiel requirement based on the model to the actual amount of materiel stocked at the TLAMMs (immediately available) and available on contract (2- to 3-day lag time). For LOGWAR-15, we primarily focused on the discrepancy between the actual available/on contract amount of materiel and the expected requirement from our scenario for the four items of interest.

¹² Urban operations are conducted in large, densely populated areas with problems unique to clearing enemy forces, while possibly restoring services and managing major concentrations of people. Joint forces may be required to take steps necessary to protect and support noncombatants and their infrastructure, from which they receive services necessary for survival (Source: Joint Publication 3-0: Joint Operations, U.S. Department of Defense, Joint Staff. August 11, 2011).

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Appendix B: Repair Parts

This appendix to the Joint Staff J-4's LOGWAR-15: Gamebook outlines the specifications for and characteristics of the Class IX spare parts logistics in LOGWAR-15. The first section of this appendix briefly describes the sources of information. It is followed by a detailed discussion of each engine.

We first discuss the General Electric T-700 series of engines, followed by the Rolls Royce AE 1107C engine. In the discussion for each type of engine, we present an overview, as well as Service-specific details for that engine. We also provide a summary table of engine-specific information broken out by Service.

Finally, we provide an overview of two ground vehicle engines, though they were not used in LOGWAR-15.

Introduction

Class IX logistics

Class IX includes repair parts and components, including kits, assemblies, and subassemblies (repairable or non-repairable) required for maintenance support of all equipment.

Why focus on Class IX logistics

CNA chose Class IX materiel as a focus for LOGWAR-15 because Class IX items are in high demand across all stages of operations, are critical to all types of unit operations, and could be shared across Services and other agencies. Any shortfall in Class IX materiel by one participant (U.S. Department of Defense, or other) has the potential to impact other participants in the operation. For example, if the U.S. Navy is unable to fly its aircraft because it does not have the components to operate its aircraft, it could be unable to deliver relief supplies or forces that international agencies and other entities rely on to perform their missions.

We could not include all Class IX logistics in LOGWAR-15, as there are too many potential items to consider. Instead, in coordination with other LOGWAR-15

participants (including the game sponsor), we chose two rotary-wing aircraft engines as proxies for Class IX materiel, for three reasons:

1. Rotary-wing transportation is predominant in the LOGWAR-15 scenarios.
2. Rotary-wing engines are among the more cumbersome Class IX items to transport and replace because they are heavy but delicate, and require materiel handling equipment that may not always be present.
3. The inability of any one Service or agency to operate its rotary-wing aircraft for tactical operations or logistical resupply could impact other Services, agencies, organizations, or partners.

We chose two specific aircraft engines as Class IX proxies in LOGWAR-15: the General Electric (GE) T-700 series of engines (e.g., T-700-GE-401C, T-700-GE-701C, and T-700-GE-701D) and the Rolls Royce AE 1107C engine. We chose the GE T-700 engines because they are used on multiple aircraft frames and by all four Services. We chose the AE 1107C engine because it is used in the vertical take-off and landing V-22, which is becoming a principal aircraft for military operations.

Sources

The engine-specific information discussed in the following sections is derived from a compilation of formal and informal sources. In most cases, we obtained the data through discussions and email exchanges with industry and Service subject matter experts. For the purpose of LOGWAR-15, we needed only average or “ballpark” figures so that we could accurately reflect injects into the scenarios. Therefore, most of the data reported below for these engines are estimates and ranges, rather than specific numbers. In some instances, we averaged across locations and across different airframes that use the same engine. Again, our goal was to represent a reasonable description of the engines and their characteristics (e.g., inventory and failure rates).

The majority of the data sources for the aircraft engines are as follows:

- **U.S. Air Force:** Air Force A4 Maintenance Policy Branch and Logistics Operations Branch
- **U.S. Army:** Common Engine Logistics Division Redstone Arsenal
- **U.S. Navy/U.S. Marine Corps:** N4 Requirements section, Commander Naval Airforces Atlantic (COMNAVAIRLANT), Commander Naval Air Forces Pacific (COMNAVAIRPAC), and the Headquarters Marine Corps Weapons Requirement Branch (HQMC APW-52) MV-22 officer.

Rotary aircraft engines

General Electric's T-700 engine series

The GE T-700 family of engines includes the T-700-GE-401C, T-700-GE-701C, and T-700-GE-701D. These engines are widely used in their class, as they power over 25 types of rotary- and fixed-wing aircraft for many countries and appear in both military and commercial aircraft.

The T-401C, T-701C, and T-701D engines are built in Lynn, MA, though some of the engine components may be manufactured elsewhere. As they all belong to the GE T-700 family, the three engines are similar. These turboshaft engines are of moderate size; each weighs around 450 pounds, is 46 inches long, and has a nominal diameter of 15.6 inches. According to the U.S. Navy, when containerized for shipment, the engines weigh approximately 777 lbs. (62 cf) each.

The T-701D is the latest of many T-701 engine variants. Its primary improvement over previous models is that it features improved hot-section components. T-701D engines can either be newly procured or achieved by applying an upgrade kit to upgrade earlier model T-701 engines (e.g., the T-701C) to the T-701D variant of the engine. In 2014, the engines cost approximately \$730,000 each.

Military Use

Each military aircraft that uses these engines requires two engines per aircraft. All of the Services can and do replace these engines in forward deployed environments, including aboard ships. They can be transported via truck and cargo air assets, including helicopters.

Table A-2 summarizes the U.S. military's use of these GE engines. We discuss specifics for each Service following the table.

Table A-2. Summary of GE T-401C, T-701C, and T-701D engine information, broken out by Service

U.S. Service	Engine	Aircraft	Engine "life" (hrs) ^a	# of spares	Avg. flight hours/month	Avg. # sorties/month	Avg. # takeoffs & landings/month
Air Force	T-701C	HH-60G Pavehawk	≈ 850	39	20–30	12	Not tracked
Army	T-701C/D	AH-64 Apaches UH-60 Blackhawk MH-60 (H, R, S)	Min. 1,500	80–90	15–20	Not tracked	36 ^b
Navy ^c	T-401C	SH-60 (B, F)	≈ 1,250	Over 150	50 ^d	23	Varies by ship (see discussion)
Marine Corps	T-401C	AH1Z ^e UH1Y	≈ 1,250	N/A ^f	18 28	19 11	170 124

^a. Each Service describes this characteristic differently. The Navy uses Mean Engine Flying Hours Between Removals, the Air Force uses Mean Time Between Removals, and the Army has no specific term.

^b. This average is based on 95-percent reporting for UH-60 A/L/M and HH-60 L/M from June 2014 through May 2015. It does not include the MH-60 aircraft flown by the 160th Special Operations Aviation Regiment.

^c. We do not include the presidential helicopters.

^d. The number of hours can be higher when deployed if conditions warrant.

^e. There are 36 AH-1Zs that were manufactured from AH-1W carcasses and have T-700-GE-401 engines installed. The T-401 and the T-401C are not interchangeable.

^f. All Marine Corps spares are included in the Navy number.

U.S. Air Force

The Air Force uses the T-701C and/or T-701D engine in its HH-60 Pavehawk aircraft.

The Air Force has 239 engines on hand. Of these, 200 are installed on 100 helicopters, resulting in 39 engines that are either ready for issue or are being repaired. The Air Force has a requirement to maintain a minimum of 22 of the 39 spare engines serviceable (for the HH-60 fleet). This minimum serviceable spare engine requirement is called “war readiness engine” and is computed annually, based on multiple factors. It is intended to support 30 days of forward deployed operations until resupply is established. Spare engines are included in the deployment packages based on predetermined levels for each combatant command. These levels are contingent of the number of deployed aircraft. Typical resupply time is approximately 15 days.

The Air Force has no production line contract, and the majority of its overhaul support is from the Army. The Air Force is Secondary Inventory Control Activity to the Army Primary Inventory Control Activity. In the event that an engine needs to be

procured, the Air Force can purchase it from the Army, which treats the T-700 as a commodity.

The Air Force uses Mean Time Between Removals (MTBR) for the GE engines. Currently, the Air Force estimates the MTBR for the T-701s to be approximately 843 hours (although its goal is 595 hours).

If an engine is removed, then it can either be repaired on station or retrograded if it is deemed “not repairable this station.” Typically, an engine is returned to the owning organization home station for repair. However, repairable modules and major overhaul are done at the Corpus Christi Army Depot (CCAD) in Texas.

U.S. Army

The U.S. Army uses the GE T-701C and/or -701D engines in its Blackhawks and Apaches. The Army is currently upgrading all T-701C engines to the D variant as they come in for service. This is done at the CCAD and multiple commercial facilities throughout the United States.

The Army maintains four months' worth of stock on hand for the T-701C/D engines. At the current time, this translates to between 80 and 90 engines and is based on historical demand. The spare engines—including the aviation units, themselves—are stocked at various locations. A deployed battalion would typically have one or two spare engines with its supply activity. Depending on the situation, additional spare engines would be stocked elsewhere in theater. As a spare engine is used, a replacement spare is immediately ordered and delivered forward.

The Army contract for “spare” GE engines covers all the Services that use these engines. This contract is currently expired. For the Army, this means that it is no longer procuring “new” spare T-701C or D engines.

Although the Army tracks engine hours, it does not do so specifically for replacement purposes. The GE engines are removed when they are not meeting performance standards. That said these engines have several limited life parts. Because the Army uses the modular maintenance concept, such parts could have different total operating hours on them. When a part's life limit is reached, then that component and/or module is replaced. According to the Army, if two or more modules or components had parts reach their life limit around the same time, then a decision might be made to replace the engine. Engines or components are rarely removed from service due to life-limited parts.

Engines issued from supply have at least 1,500 hours remaining on each life-limited part. On average, an Army Blackhawk or Apache flies between 15 and 20 hours per

month. For the past year, the Army's UH-60s and HH-60s have, on average, reported approximately 36 takeoffs and landings per month.¹³

U.S. Navy and Marine Corps

The U.S. Navy, including the U.S. Marine Corps, uses the T-401C engine in its MH-60 Seahawk and Knighthawk, SH-60 Seahawk, and AH1Z Viper aircraft. It is important to note that the Navy can transport these engines (for both delivery and retrograde) via Carrier Onboard Delivery, connected replenishment (CONREP), and vertical replenishment (VERTREP).

The number of Seahawks and/or Vipers can vary per deployment. On average, if 10 H-60s are deployed on a Carrier Strike Group, there are typically seven spare T-401C engines. Most of these spares (usually four) are kept in the carrier engine pool. However, at least one spare engine (sometimes two) is stocked on each smaller air capable ship that is carrying one or two aircraft, as these ships may operate away from the carrier (one spare per ship). The Marines will take, on average, four spare engines in an Amphibious Ready Group to support the UH-1Y/AH-1Z/H-60 aircraft. In general, the Navy plans to have, on average, about 80 engines deployed aboard ship at any given time and approximately 28 engines forward deployed in land-based pools.

Although the Navy is continuing to procure new aircraft with new engines, the Army contract that the Navy used to procure "spare" T-401C engines has expired. As such, no spare engines are currently being procured. That said, the current Navy stock is 104 percent (i.e., it is four percent above its engine-stocking goal, which already includes a required number of spare engines).

The Navy uses a Mean Engine Flying Hours Between Removals (MEFHBR) of 1,250 flight hours to project engine removals and estimates that it takes between 24 and 36 months to reach this value. On average, the Seahawks and Vipers fly between 35 and 50 hours per month.

Although the T-401Cs can be and are removed in forward deployed environments, there is no repair capability on the ships or at overseas Aircraft Intermediate Maintenance Departments, so when engines are removed, they are retrograded back to the United States for repair at an Intermediate Maintenance Activity (IMA) or depot. IMA sites are located in Norfolk, VA; Mayport, FL; San Diego, CA; New River, NC (U.S. Marine Corp [USMC]); and Camp Pendleton, CA (USMC). The IMAs perform almost all engine repairs, as well as the majority of module repairs. Major overhaul

¹³ This average does not include the data for the MH-60 aircraft, flown by the 160th Special Operations Aviation Regiment.

and deep module repairs are done at the CCAD in Texas or at the GE plant in Strother, KS.

For the T-401Cs used in the H-60s, the average length of a sortie is 2.2 hours. Based on an average of 50 flight hours per month, this equates to just under 23 sorties per month. The average number of landings per sortie varies by ship. For a big deck ship, the average is one landing per sortie. For small decks (e.g., cruisers, frigates, and destroyers), the average number of landings per sortie is six.

Rolls Royce AE 1107C engine

The Rolls-Royce AE 1107C-Liberty (also known as the T-406) is a turboshaft engine that powers the Bell-Boeing V-22 Osprey tiltrotor. The AE 1107C shares a common core with both the AE 3007 and AE 2100 series of engines.

The AE 1107C is produced at the Rolls Royce factory in Indianapolis, IN (although some components may be made elsewhere). Rolls Royce provides the AE 1107C-Liberty engines under a commercial procurement agreement.

As of September 2014, Rolls Royce has delivered more than 730 engines.¹⁴

The AE 1107C is rather large. It is 78.1 inches (1,980 mm) long, and has a width of 26.4 inches, a diameter (height) of 34.2 inches (890 mm), and a dry weight of 971 pounds (440 kg). Because of its size, extended boom forklifts, tractors, and rough terrain container handlers are required to move/work with these engines. According to the USMC, it builds specific containers (i.e., cans) to transport these engines. Although large, the AE 1107C can be removed and replaced by a unit when forward deployed. A special winch is attached to the engine casing to raise the engine.

Replacement engines can be delivered via truck, cargo aircraft, another V-22, CONREP, or VERTREP (if necessary). A winch, a special engine box, and rolling stock are required to remove/replace and move the AE 1107C.

In 2014, each engine cost approximately \$2.20 million.

Military Use

This engine is used by both the Marine Corps in its MV-22 and the Air Force in its CV-22.

¹⁴ Source: <http://www.bga-aeroweb.com/Engines/Rolls-Royce-T406-AE-1107C.html>.

Under the agreement between the U.S. military and Rolls Royce, Rolls Royce performs almost all maintenance on the AE 1107C at its facility in Oakland, CA. Marine Corps and Air Force maintenance personnel do almost no work on the engine. However, military personnel do perform the removals and emplacement of the engines (except for new aircraft procurements). The repair standard under the agreement requires that Rolls Royce return an engine within 75 days of its receipt at the Oakland facility.

Table B-1 summarizes the Air Force's and Marine Corps' characterization of their use of the AE 1007C engine. Following the table, we discuss specifics for the two Services.

Table B-1. Summary of Rolls Royce AE 1107C engine, broken out by Service

U.S. Service	Engine	Aircraft	Engine "life" (hrs) ^a	# of spares	Avg. flight hrs./month	Avg. # of sorties/month	Avg. # of takeoffs & landings/month
Air Force	AE 1107C	CV-22 Osprey	≈ 542	56	30 ^b	7	49
Marine Corps	AE 1107C	MV-22 Osprey	≈ 1,096	43	18–20	No information available	No information available

^a. Each Service describes this characteristic differently. For this engine, the MEFHBR and the Air Force use Average Time on Wing.

^b. Thirty hours is the current average. However, during wartime, it could be as high as 60 to 90 hours.

U.S. Air Force

The Air Force uses the AE 1107C for its fleet of CV-22 aircraft and has 56 spare engines for its fleet of 50 CV-22s. On average, about 30 spare engines are ready for issue.¹⁵ The Air Force is not currently procuring additional CV-22s or spare engines.

A typical CV-22 squadron has 10 aircraft. The number of spare engines varies by location and current conditions. The current laydown of spares is as follows:

- RAF Mildenhall (England): 4 engines
- Cannon Air Base (New Mexico): 10 engines
- Hurlburt Field (Florida): 13 engines
- Kirkland Air Force Base (New Mexico): 10 engines.

¹⁵ As of 10 June 2015, 37 spare engines were in stock and ready for issue.

When a squadron goes forward, it typically takes several spare AE 1107C engines with it. Typically, the Air Force will have at least five spares forward-stocked in the area of responsibility in which the squadron is deployed/operating. It could take up to four weeks to transport additional spare engines forward for austere locations.

The Average Time on Wing for the AE 1107C in the Air Force is 542 hours. On average, CV-22s fly about 30 hours per month. Recently (for May 2015), the average was 21 hours per month. At the height of wartime operations over the past years, the average flight hours per month were as high as 60 to 90 hours. Based on May 2015 flight data, the average number of sorties per month for a CV-22 is 7, and the average number of takeoffs/landings per month is 49. As the data show, it is common for the CV-22 to have multiple takeoffs/landings per sortie.

U.S. Marine Corps

The Marine Corps uses the AE 1107C in its MV-22 Osprey. A Marine Medium TiltRotor Squadron (i.e., a VMM squadron) is composed of 12 MV-22s. Typically, a squadron would have two spare engines as part of the Marine Aviation Logistics Squadron stock. A Marine Expeditionary Unit typically takes two spare AE 1107C engines on deployment.

The Marine Corps averages an MEFHBR of 1,096 hours for its MV-22 AE 1107C engines. The current average number of flying hours per month for an MV-22 is 18 to 20 hours.

As discussed, the AE 1107C can be removed in a forward deployed location. Typically, if all materials are on hand, it takes about four hours to replace an engine.

The Marine Corps is still procuring MV-22s, which will come with AE 1107C engines. We have no information on the number of spare engines that are stocked or if spare engines are still being procured.

Ground vehicle engines

In addition to rotary engines, we researched two ground vehicle engines; however, they were not used in LOGWAR-15. Below, we detail our initial findings.

Caterpillar C7 diesel

The Caterpillar C7 diesel engine is found in ground vehicles such as Cougar Mine-Resistant Ambush Protected vehicles (MRAPs) and Strykers. All Services use the MRAPs, while just the Army uses Strykers. The engine weighs over 1,500 lbs. and occupies a volume of 28 cubic feet.

The engine is only manufactured in Texas. There is a base design for the engine, but each contract results in particular specifications based on the intended use; each engine configuration results in the generation of a new identification number. While the basic information to begin the production process is readily available, generally there is little to no inventory on hand.

The engines are shipped domestically via trucks and flown overseas; contracts determine the specifics. Caterpillar has dealers worldwide to help with repairs, though they have limited capabilities overseas.

General Engine Products OPTIMIZER 6500

The OPTIMIZER 6500 V-8 diesel engine is found in High Mobility Multipurpose Wheeled Vehicles (i.e., Humvees), which all Services use. It weighs 756 lbs. The engine is exclusively manufactured at the General Engine Products assembly plant in Franklin, OH.

The engines are made to fill orders and, thus, are not stocked in warehouses for on-hand distribution. The engines are domestically shipped via trucks and flown overseas; specifics are left up to the contract. Mac Motors is the main U.S. distributor, while Optimum Vehicle Logistics handles overseas distribution. The engines can be shipped general freight. They are mainly sold to U.S. Pacific Command, and sometimes to the Defense Logistics Agency. General Engine Products sells the repair parts, but these repairs are handled at the individual military unit level.

Appendix C: Force Structure and Airfield/Port Data

This appendix to the Joint Staff J-4 LOGWAR-15: Gamebook outlines the force structure for U.S., coalition, and red forces used for the LOGWAR-15 event. It also provides an overview of the fictitious airfield and port data provided to event participants.

Sources

The laydown for LOGWAR-15 was constructed from various sources, many of which may be found online. We are also indebted to the CNA field reps and the Australian liaison officer (LNO) for their support. It may be necessary to revisit these sources (as well as others) for future versions of LOGWAR, as the Armed Forces continue to undergo reorganization and transition to peacetime operations. For airfield and port data for the fictitious Lemuria, the study team reviewed real-world data on airfield and port dimensions of a comparable size.

Force structure

The force laydown for LOGWAR-15 was created to support the scenario vignettes.¹⁶ To limit the number of pieces, CNA (the event designers) decided that all U.S. forces would be represented at the battalion level. The only exception arose within Army combat aviation brigades, each of which included one or two squadrons. We decided to include these squadrons to provide an accurate count for all rotary-wing aircraft in theater. The sources for this laydown included conversations with field representatives and LNOs, as well as internet sources.

¹⁶ The scenarios in the event covered Disease, Transportation, and Insurgency.

U.S. Marine expeditionary forces

The laydown for I Marine Expeditionary Force (MEF) was almost completely determined by conversations with the I MEF field representative. The event designers met with the field rep during field week and asked for any information on the current units within I MEF. Soon after the meeting, the field rep provided CNA with the order of battle for a recent MEF-level exercise, *Assured Resolve*. These documents contained several important sources of information, including the infantry battalions and the number of rotary-wing aircraft that took part in the exercise. Since the field rep informed CNA that several Marine reserve and Army units also took part in *Assured Resolve*, we cross-referenced this information with the I MEF website.

Once we determined a rough order of battle for I MEF, we contacted the III MEF field rep to request information on the III MEF order of battle. The laydown for III MEF proved to be more challenging, due to the Unit Deployment Program (UDP). Under UDP, at least two battalions from I MEF and II MEF are assigned to the 4th Marine Regiment in III MEF. These battalions rotate every six months. The field rep provided CNA with some information on the planned laydown for 2014-2015; however, this information did not match the *Assured Resolve* order of battle. More specifically, the planned UDP battalion from I MEF in early 2015 also appeared among the battalions listed in *Assured Resolve*. Instead, a different battalion from I MEF was missing from the *Assured Resolve* order of battle.

To clarify these discrepancies, the event designers investigated the III MEF website. Unfortunately, this added further ambiguity. Not only did the III MEF website contradict our I MEF laydown, it also contradicted information from the III MEF field rep. Moreover, we found that I MEF contributed a battalion to 31st Marine Expeditionary Unit (MEU). Unfortunately, CNA was unable to verify this information in I MEF or III MEF documentation from field representatives. The event designers resolved the differences by removing two battalions from the laydown from I MEF. These battalions were used to supplement III MEF: one satisfied the UDP requirement, the other the MEU. The first battalion removed from I MEF matched the battalion missing from *Assured Resolve*; the second battalion was determined from the 31st MEU website.

We planned to replace these battalions in I MEF from the reserves. However, during the Final Planning Conference, several logistics planners expressed skepticism with our laydown. They believed we were already overstating the number of battalions that would deploy. As such, we did not include any reserve battalions in the order of battle.

Given that each MEF also included an air component, we included the number of rotary-wing aircraft within our laydown. The information from *Assured Resolve* provided us with the number of aircraft within 3rd Marine Aircraft Wing (MAW). Our

conversation with the III MEF field rep did not yield any information on aircraft numbers. Therefore, we extrapolated from the *Assured Resolve* order of battle to 1st MAW. Once we completed our laydown for both I MEF and III MEF, we turned our attention to the Army units.

U.S. Army divisions

The laydown for U.S. Army forces was constructed primarily through individual unit websites and Army doctrine. Each of the 7th Infantry, 101st Airborne, 1st Armored, and 1st Cavalry Divisions provided websites with various levels of details. When necessary, we also consulted Wikipedia and Global Security to supplement unit websites.

The Joint Base Lewis-McChord website was quite detailed and provided information on the 7th Infantry Division. This information appeared to be updated regularly, based on the information available on individual webpages. Accordingly, we created a full order of battle from this website. Unfortunately, we were unable to determine how many aircraft were included in each battalion in the combat air brigade.

The websites for the 1st Armored and 1st Cavalry divisions were less helpful. In particular, the 1st Armored Division webpages were either under construction or had not been updated since 2012. To create a believable laydown for this division, we consulted the unclassified Intellipedia, Global Security, and Wikipedia, with highest priority paid to Intellipedia. The website for 1st Cavalry Division was slightly better; however, it also had not been updated in nearly a year. We followed the same process as with the 1st Armored Division.

It is worth noting that Wikipedia was particularly helpful in finding recent information on unit deactivations. For example, our initial laydown for the 1st Armored Division included four brigade combat teams (BCTs), based on our research. Wikipedia provided links to official press releases detailing the planned reorganization of the 1st Armored Division. This allowed us to create a more accurate laydown. Wikipedia was also helpful in providing a laydown for the 101st Airborne Division. In this case, the website for the 101st Airborne Division appears to be updated regularly. However, deactivated units were not removed from the website until after the date of deactivation. Wikipedia provided links to press releases on the planned deactivation of the 159th Combat Aviation Brigade (CAB) and the reorganization of the 101st CAB in advance. Soon after the 159th CAB was deactivated in June 2015, the necessary changes were made to the 101st Airborne Division website; however, without Wikipedia, our laydown would have been incorrect when we sent pieces to the printer.

Unfortunately, none of these sources provided information on the number of aircraft within Army aviation battalions or squadrons. To determine aircraft numbers, we

consulted Army doctrine documents, which provided us with the doctrine for Heavy Combat Aviation Brigades. From this, we were able to determine the number of aircraft in the 1st Cavalry Division. While conducting this search, we discovered some press releases that suggested that the number of aircraft in the other divisions has recently been altered. One source¹⁷ provided a description of current Army aviation. From this document, we were able to construct a reasonable laydown.

U.S. expeditionary air forces

We then turned our attention to the laydown for an expeditionary air force. Given that we had recently used Army doctrine to determine aircraft numbers, we investigated U.S. Air Force (USAF) doctrine for the construction of an Air Expeditionary Task Force (AETF). Unfortunately, USAF doctrine states, "The AETF leverages this fundamental concept, presenting a scalable, tailorable organization with three elements: a single, clearly designated commander; appropriate command and control mechanisms; and tailored and fully supported forces."¹⁸ In other words, an AETF varies based on the mission. We did find that an AETF can contain several wings if necessary. Following naming conventions, we constructed the 5th Expeditionary Air Force, which would consist of several Air Expeditionary Wings (AEWs).

To determine the size of these Wings, we first consulted Wikipedia and Global Security for historical examples. While we did find many historical examples, these examples rarely listed information on the number of aircraft present at a specific time. We also investigated the Central Command Air Force website, which provided us with current aircraft usage for AEWs in theater. Unfortunately, while each AEW provided a list of aircraft operated, it failed to provide the numbers of each aircraft. We found the most helpful description to be the 455th AEW Fact Sheet.¹⁹ This provided some specifics for the number of squadrons present. Research into doctrine failed to provide hard numbers for the size of these squadrons; however, we were able to extrapolate from sources, including Wikipedia, Military Periscope, and Global Security.

¹⁷ See:
https://www.usa.org/publications/torchbearercampaign/tnsr/Documents/TB_Aviation_web.pdf.

¹⁸ Source: <https://doctrine.af.mil/download.jsp?filename=3-30-D38-C2-AETF.pdf>.

¹⁹ See:
<http://www.afcent.af.mil/Units/455thAirExpeditionaryWing/FactSheet/Display/tabid/336/Article/589873/455th-air-expeditionary-wing-fact-sheet.aspx>.

Therefore, we used the 455th AEW as a template for multiple AEWs. However, we still needed to determine the total number of aircraft to be sent. To determine these numbers, we consulted several sources. The Federation of American Scientists provided a broad overview of an Air Expeditionary Force from the early 2000s. While this information is dated, it provided a starting point by suggesting around 170 aircraft. We then turned our attention to previous games and data gathered to support them. Previous sources provided an upper bound on the number of aircraft available in theater. Combining this information with information on the 455th AEW, we constructed the 5th Expeditionary Air Force, which consisted of about 140 aircraft. Revisiting the laydown, we realized that we needed further rotary-wing aircraft to support Special Operations Forces. Therefore, we added a Special Operations Group, which brought our total to around 150 aircraft.

U.S. medical units

The medical situation for the U.S. forces was more troublesome. According to several sources, much of the Army Role II medical care originates from the Brigade Combat Teams Brigade Support Battalion Medical Company. Moreover, each combat battalion has a medical platoon. Furthermore, depending on the number of divisions deployed, the Army would deploy several medical brigades. Given that we did not want to oversaturate the map with pieces, we eventually decided to create pieces to represent Role I and Role II²⁰ care generically.

For each BCT, we created multiple Role I and Role II pieces. Each division contained two Role II pieces per BCT, as well as two Role I pieces per BCT. This laydown attempted to provide adequate pieces for medical play without overwhelming the board. For the Marine Corps, we followed a similar strategy. Each MEF was assigned roughly 13 forward medical care pieces. These pieces could function as either Role I or Role II for the Marine Corps.

Finally, we created several Role III Hospitals for the U.S. forces. Initially, we had planned on including only a single hospital based on our discussions with the medical community; however, several weeks before the event, a Senior Medical Logistics Analyst stated that the U.S. Army would likely create two combat support hospitals within Lemuria. As this coincided with a vignette, we added a second hospital at that time. We also failed to initially create pieces to represent the expeditionary medical facilities. Given the late notice for these pieces, we utilized excess medical facilities pieces as representation.

²⁰ Role I units provide point-of-injury care, primarily from first responders; Role II units provide primary care, optometry, dentistry, behavioral healthcare, and combat casualty care.

Red forces (West Lemuria)

In the early stages of the event, the event designers provided a nearly complete laydown for the red (West Lemurian) forces. However, the laydown changed frequently, and the creation of vignettes helped to finalize decisions. The laydown was driven by narrative, which stated that most West Lemurian forces had either been defeated or had withdrawn to the north-central islands, specifically those in the Benton Province. We constructed the remaining forces from a combination of the Benton Home Army, remnants of reserves, and the IV Corps from Poseida. These units were represented at the division level to limit the number of pieces necessary.

Coalition forces (East Lemuria and Korona)

The East Lemurian pieces followed a similar path. In the early stages of the event, we had a rough laydown for the number of divisions. Following the development of the story, we determined that 4 of the 22 divisions would no longer be battle-ready at the start of our vignettes. The game book provided information that the East Lemurian military suffered more losses in the fight around the capital. Therefore, we removed three divisions from X Corps and one division from XIV Corps. As in the case with West Lemuria, we created the laydown at the division level. Moreover, based on the requirements from each vignette, we added two full-strength East Lemurian Combat Support Hospitals and two partial Combat Support Hospitals to the East Lemurian laydown.

To determine a laydown for the Koronan forces, the event designers met with Colonel Andrew MacLean, the Australian LNO to J-4, in June 2015. He provided us with a detailed laydown for an Australian Defense Force expeditionary force, and we based most of the Koronan Forces on this laydown. We added a Role III Hospital to the laydown as a requirement for part of the medical vignette.

Table C-1 summarizes the LOGWAR-15 force structure.

Table C-1. LOGWAR-15 force structure

I MEF	10 x Inf Bn 4 x Arty Bn 2 x LAR Bn 1 x Tank Bn 1 x Assault Amphib Bn 1 x Recon Bn 1 x Combat Engineer Bn 1 x Law Enforcement Bn 3 x Combat Logistics Bn 1 x Med Bn 1 x Dental Bn 1 x VMGR Sqdrn: 9 a/c 5 x VMM Sqdrn: 60 a/c 4 x HMLA Sqdrn: 108 a/c 3 x HMH Sqdrn: 48 a/c
III MEF	5 x Inf Bn 2 x Arty Bn 1 x Recon Bn 1 x Combat Assault Bn 31 st MEU (1 x BLT, 1 x VMM Sqdrn: 12 a/c) 2 x Combat Logistics Bn 1 x Med Bn 1 x Dental Bn 1 x VMGR Sqdrn: 9 a/c 1 x VMM Sqdrn: 12 a/c 1 x HMLA Sqdrn: 27 a/c 1 x HMH Sqdrn: 16 a/c
7th Infantry Division	6 x Inf Bn 2 x Arty Bn 2 x Brigade Support Bn 2 x Cav Sqdrn 1 x Attack Recon Sqdrn (AH-64D) 3 x Avn Bn (24 x AH-64D, 38 x UH-60, 12 x CH-47, 15 x HH-60) 2 x Arty Bn 2 x ADA Bn
101st Airborne Division	9 x Inf Bn 3 x Cav Sqdrn 3 x Arty Bn 3 x Brigade Eng Bn 4 x Avn Bn (42 x OH-58D, 38 x UH-60, 12 x CH-47, 15 x HH-60)

1st Armored Division	5 x Inf Bn 4 x Armored Bn 3 x Cav Sqdrns 3 x Arty Bn 1 x Cav Sqdrn (AH-64) 1 x Avn Bn (8 x UH-60, 12 x CH-47, 15 x HH-60)
1st Cavalry Division	3 x Cav Sqdrn 9 x Combined Arms Bn 3 x Brigade Eng Bn 4 x Arty Bn 4 x Avn Bn (48 x AH-64D, 38 x UH-60, 12 x CH-47, 12 x HH-60)
Koronan Forces	2 x LHD 2 x MH-60R Seahawk 1 x LSD 4 x LCH 8 x LLC 8 x MRH-90 Medium Lift Helicopters 9 x Eurocopter Armed Reconnaissance Helicopters 6 x CH-47F Heavy Lift Helicopters 2 x MH-60R Seahawk 1 x DDG 2 x FFH with 2 x MH-60R Seahawk 1 x Support Ship 1 x Mine Hunter Coastal 1 x SSG 6 x F-35 2 x EA-18G Growler 4 x C-17 Globemaster III 4 x C-130J Hercules 1 x KC-30A MTT 2 x P8 Poseidon 2 x E-7A Wedgetail 1 x Inf Bn (Reinforced)
West Lemurian Forces	2 x Division (Benton Home Army) 1 x Division (IV Corps) 1 x Division (Reserve)
East Lemurian Forces	X Corps: 8 x Division (5 Combat Ready) XIV Corps: 8 x Division (7 Combat Ready) Reserves: 6 x Division

Airfield and port data

The white cell provided participants with data on Lemurian airfield and port dimensions. For airfields, this included: data on the physical location of the airfields, whether they were intended for civilian or military use; the number of runways; runway length; runway surface; hangar dimensions; and airport apron dimensions. For the ports, this included: data on the physical location of the piers; the number of piers; warehouse dimensions; berthing dimensions; and information on equipment for cargo handling. This data was intended to give participants enough information needed so that they could make appropriate decisions within game space about what assets could conceivably flow in and out of aerial and sea ports of debarkation. Tables C-2 and C-3 on the following pages provide more information on LOGWAR-15 airfields and ports.

During the event, participants requested further data on airfields and ports, so that they were able to understand whether their requests were realistic within the event scenario.

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Table C-2. LOGWAR-15 airfields

Country	Island	Province	City	Civilian/ Military/ Dual-use	# of runways	Runway length	Runway surface	Hangar space (sq. meters)	Airport apron (sq. meters)
West Lemuria	Poseida	Adams	Franklin	Civilian	1	7,000 ft.	Concrete	20,500	270,000
			Mitchell	Dual-use	3	9,000 ft. (A) 9,500 ft. (B) 9,500 ft. (C)	Concrete	40,000	480,000
	N/A	Howard	Mills	Civilian	1	5,000 ft.	Asphalt	None	100,000
	N/A	Davis	Story	Civilian	2	7,000 ft. (A) 6,500 ft. (B)	Concrete	30,000	330,000
	Atlantea	Cedar	Jasper	Civilian	1	6,000 ft.	Concrete	None	70,000
			Union	Military	2	9,000 ft. (A) 9,500 ft. (B)	Concrete	40,000	390,000
		Greene	Dickinson	Civilian	1	6,000 ft.	Concrete	30,000	260,000
			Calhoun	Military	2	9,000 ft. (A) 9,500 ft. (B)	Concrete	40,000	380,000
			Clayton	Civilian	1	5,000 ft.	Asphalt	None	60,000
			Woodbury	Civilian	1	6,000 ft.	Concrete	None	70,000
East Lemuria	Atlantea	N/A	Plymouth	Dual-use	4	9,500 ft. (A) 10,000 ft. (B) 10,500 ft. (C) 10,500 ft. (D)	Concrete	50,000	500,000
		N/A	Tama	Military	3	9,000 ft. (A) 9,500 ft. (B) 9,500 ft. (C)	Concrete	50,000	480,000

Table C-3. LOGWAR-15 ports

Country	Island	Province	City	# Piers	Warehousing (sq. feet)	Berthing length x depth (feet)	Cargo-handling equipment
West Lemuria	Poseida	Adams	Franklin	2	7,000	660 x 11	None
			Clarke	2	6,500	650 x 10	None
			Mitchell	4	12,000	720 x 20	2 x 37 short ton portainers (wharf-side container crane)
	N/A	Fremont	Monroe	2	6,000	550 x 11	None
	N/A	Davis	Story	1	5,000	500 x 10	None
	N/A	Emmet	Polk	1	5,000	400 x 8	None
	Atlantea	Cedar	Jasper	5	15,000	800 x 15	3 x 37 short ton portainers (wharf-side container crane)
			Union	2	8,000	600 x 9	None
East Lemuria	Atlantea	N/A	Wayne	5	20,000	1200 x 38	3 x 37 short ton portainers (wharf-side container crane)
			Port Cedar	3	10,000	700 x 15	1 x heavy cargo-handling forklift
			New Mako	5	15,000	1000 x 30	2 x 37 short ton portainers (wharf-side container crane)
Korona	N/A	N/A	Louisa	1	2,000	300 x 5	None
			Marion	3	10,000	850 x 25	1 x 37 short ton portainers (wharf-side container crane)
			Allamakee	2	8,000	800 x 28	1 x heavy cargo-handling forklift

Appendix D: International and Nongovernmental Organizations

This appendix to the Joint Staff LOGWAR-15: Gamebook explains the background research into WASH (water, sanitation, and hygiene) and POL (petroleum, oil, and lubricants) logistics elements for LOGWAR-15. It also details the support that CNA (the event designers) received from subject matter experts in international and nongovernmental organizations (IOs and NGOs, respectively).

Introduction

What are WASH and POL materiel?

WASH materiel falls within Class I materiel, which includes rations, water, and gratuitous health and comfort items. POL materiel fall within Class III materiel, which represents all fuel supplies and supporting chemicals, such as lubricants, hydraulic fluids, antifreeze, and other materiel.

Why focus on WASH and POL logistics?

CNA chose WASH and POL as focal materiel for LOGWAR-15 because they tend to be large, bulky items needed in mass quantities for sustained periods by multiple actors, thus stressing the Joint Logistics Enterprise (JLEnt). These types of materiel would cause friction points across the worldwide logistics chain, particularly for IOs and NGOs, which would need to turn to the U.S. military to fulfill shortfalls. For example, heavy lift is an area where IOs and NGOs struggle and in which the military can assist.

IOs and NGOs provide the bulk of WASH items during humanitarian assistance and disaster relief (HADR) responses, but may not have the necessary capacity to transport such items from logistics hubs to end users. Historically, these organizations have relied upon military airlift, primarily rotary-wing aircraft, to supplement their capabilities. WASH commodities are particularly crucial in an HADR response, as inadequate clean water and sanitation, coupled with poor hygiene practices, have the potential to kill thousands and exacerbate the dangers of an HADR response. Unlike ordnance, ammunition, or repair parts, POL materiel is universal regardless of actors. All JLEnt partners—including U.S. Department of

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Defense (DoD) partners, coalition forces, IOs, and NGOs—rely on POL materiel in large quantities. CNA decided to use mobile power generators as representative of POL in the logistics chain, due to their large size and because all actors rely on them in an HADR event. We decided to forego liquid POL commodities, as the military often incorporates them in games and because IOs and NGOs often use large generators that may not fit within rotary-wing aircraft (requiring they be slung or transported by land), further stressing the JLEnt, especially during hostilities when convoys may come under fire.

Of particular concern to IOs and NGOs is their reluctance to interact with military units during the delivery of needed resources, because of their concerns about maintaining the perception of independence and impartiality. Coordination mechanisms are critical to commodity distribution in an HADR response, during which humanitarian and military actors are often physically separated while relying on the same airports, ports, and road networks. By focusing on WASH and POL, CNA wanted to highlight the friction between military actors and the IO/NGO community, while allowing them a space to work together constructively within the JLEnt.

Finally, WASH and POL have multiple challenges, including transportation, storage, procurement, retrograde, and maintenance.²¹ To ensure that LOGWAR-15 highlighted potential weaknesses and flaws in the current JLEnt system, and to fully engage participants, CNA interviewed stakeholders on:

- Historical operations to highlight the friction and synergies of commodities needed by both military and IO/NGO stakeholders;
- The current state of/processes for obtaining and sharing WASH and POL commodities;
- Items that would exercise the processes of the JLEnt more broadly; and
- Estimations of supply and demand for materiel.

Below, we discuss our process and findings in more detail.

Historical modes of operation

CNA staff held semi-structured interviews with stakeholders within the IO and NGO fields, focusing on the United Nations (UN) and organizations with an established logistics capability and that often interact with the Services. For instance, the UN Office for the Coordination of Humanitarian Affairs (UNOCHA) brings humanitarian

²¹ However, these areas are not unique to Class I and Class III materiel.

actors together and coordinates the humanitarian response to a crisis. The World Food Program is the UN logistics agency and chairs the Logistics Cluster (more on this below), which deconflicts logistics during a crisis. We contacted other UN agencies because of their particular focus on WASH, including the UN International Children's Emergency Fund (UNICEF) and the World Health Organization (WHO). For IOs, CNA focused on the American Red Cross because of its vast experience supporting disaster relief and on Médecins Sans Frontières (MSF). MSF has its own logistics operation and would likely already be operating on the ground in a crisis. All of these organizations participate in the UN cluster system as a mechanism for coordination and deconfliction.

The cluster system

Coordination is vital in emergencies. Good coordination means fewer gaps and overlaps in humanitarian organizations' work. It strives for a needs-based (rather than capacity-driven) response. It aims to ensure a coherent and complementary approach, identifying ways to work together for better collective results.

The UN uses a “cluster” approach to coordinate humanitarian organizations during a crisis. This approach provides a clear point of contact that is accountable for specific humanitarian assistance, and it allows agencies to “bin” humanitarian organizations into groups called clusters. The clusters are created when clear humanitarian needs exist within a sector, when there are numerous actors (local, national, and international) within sectors, and when national authorities need coordination support. These clusters are coordinated by a Humanitarian and Emergency Relief Coordinator appointed by the Under-Secretary-General and Emergency Relief Coordinator at UNOCHA. UNOCHA provides coordination for all UN agencies and humanitarian organizations in the clusters and allows for inter-cluster coordination, needs assessment, planning, monitoring, and evaluation.²²

The clusters and their leads include the following:

- **Camp Management & Coordination:** UN High Commissioner for Refugees (UNHCR); International Organization for Migration
- **Early Recovery:** UN Development Programme
- **Education:** UNICEF; Save the Children
- **Emergency Shelter:** UNHCR; International Federation of Red Cross and Red Crescent Societies
- **Emergency Telecommunications:** World Food Programme (WFP)

²² Source: <http://www.unocha.org/what-we-do/coordination-tools/cluster-coordination>

- **Food Security:** Food and Agriculture Organization of the United Nations; WFP
- **Health:** WHO
- **Logistics:** WFP
- **Nutrition:** WFP
- **Protection:** UNHCR
- **Sanitation, Water & Hygiene:** UNICEF.

The Logistics Cluster is the one most relevant to the U.S. military and the one it participates in most often during an HADR response. Of note, one of the main challenges facing the cluster system is a lack of formal decision-making mechanisms or mandates.²³

Arriving before the U.S. military

Legally, the UN must work through the host nation; the UN survey teams arrive in the first 24 hours of a crisis and liaise with host-nation military assets. IO and NGO stakeholders are often in place long before the U.S. military arrives. This means that they already have a logistics chain in place (including port and airport slots), have government and host-nation military contacts, and have relations with any opposing or rebel forces. NGOs (particularly MSF) have strong ties within a country prior to an HADR response, and it is in the interest of the U.S. military to coordinate with them through the UN cluster system to avoid duplication of effort and potential problems on the ground.

IOs and NGOs often require that local resources perform the final delivery step. Such organizations normally hire locals with understandings of the social mores and geography to smooth over any problems with end distribution. Additionally, it is hoped that when the IOs/NGOs are no longer needed and a crisis is over that these locals will have job continuity when global logistics providers leave.

The provider organizations also noted that they were concerned that the U.S. military would confuse the cluster system and destabilize the balance with the local culture—and possibly with rebel groups—that the IOs/NGOs have carefully cultivated. There is also concern among IOs/NGOs that they would be associated with U.S. military forces and could be targeted by local actors and/or rebel groups.

²³ Source:

http://www.slate.com/articles/news_and_politics/dispatches/features/2011/does_international_aid_keep_haiti_poor/the_un_cluster_system_is_as_bad_as_it_sounds.html.

Finally, the IO/NGO community has legal concerns about operating with the JLEnt. Numerous interviewees raised the issue of instances in which their organizations could not support a U.S. Agency for International Development contract because the United States had labeled a group as a terrorist group, limiting the ability of organizations to provide support in areas where such groups operate. However, due to the impartiality of IO/NGOs, they often need to negotiate access with these groups, complicating humanitarian response.

Understanding the IO/NGO chain

Interviewees noted that the JLEnt does not currently take IO/NGO logistics into consideration. Many of these organizations have multiple large, modern warehouses stationed around the world that are able to help during regional crises. For example, UNOCHA relief items are currently stored in the main UN Humanitarian Response Depot (UNHRD), located at Italy's Brindisi military airport, as well as regional logistics hubs. WFP manages the central warehouse, which serves as a logistics and storage facility that allows the UN to respond rapidly to crises. The Italian Government covers the depot's operational costs. The UNHRD also houses stocks (e.g., emergency food aid, various types of relief goods, mobile cooking facilities, rapid response equipment, medicines, and medical kits) belonging to WFP, WHO, the Italian Government, and select NGOs.

The Memorandum of Understanding between UNOCHA and WFP covers stockpiling of UNOCHA's goods, handling upon reception, and dispatch (including inspection and repackaging), and WFP organizes most transport arrangements from Brindisi to the final destination. UNOCHA remains responsible for stock management, donor liaison (including fundraising and reporting), stock replenishment, and dispatch orders.

WFP established its first UNHRD in Brindisi on 1 June 2000. In 2006, based on WFP's own needs and at its own cost, the WFP replicated the Brindisi model for an emergency response facility in strategic locations by creating a network of UNHRDs in Africa, the Middle East, Southeast Asia, and Latin America. The UN logistics hubs are located in:

- Accra, Ghana;
- Brindisi, Italy (main hub and logistics headquarters);
- Dubai, UAE;
- Las Palmas, Spain;
- Panama City, Panama; and
- Subang, Malaysia.

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This global network will facilitate WFP's capacity to meet its goal of responding to three concurrent large-scale emergencies and the implementation of a fourth one.

Of note, CNA spoke with U.S. military logisticians who were unaware of the existence of such warehouses, including their capabilities and capacity. Both IO/NGO personnel and U.S. military personnel interviewed stated it would be helpful if U.S. military logisticians had a better understanding of what resources and mechanisms are available. The IO/NGOs also noted that they often draw from military logisticians when hiring, so their personnel understand military logistics.

Managing challenges in sharing WASH and POL materiel across the JLEnt with IOs/NGOs

Interviewees identified several challenges in sharing materiel between military and IO/NGO stakeholders during an HADR response, including:

- Recognizing that the UN might be the lead organization and that the JLEnt needs to leverage the cluster system to deconflict efforts;
- Understanding that IO/NGOs may not want to operate within the JLEnt, due to cost or legal concerns;
- Recognizing that IOs/NGOs are often hesitant to partner with DoD;
- Lacking knowledge about partner capabilities;
- Communicating effectively with partners, due to systems incompatibilities or difficulties with remote or forward units; and
- Recognizing cultural differences, even between IOs and NGOs.

These challenges are not unique to Class I and III materiel, but rather to JLEnt processes as a whole.

Identifying appropriate materiel for LOGWAR-15

As LOGWAR-15 was being researched, CNA had an opportunity to speak to WASH and POL stakeholders during an ongoing real-world HADR response. The 2015 earthquake in Nepal and subsequent international effort to provide humanitarian aid saw broad participation across spheres. IOs/NGOs (particularly the UN) and the U.S. military provided aid to Nepal during the crisis. CNA had an analyst forward deployed with the Marines in Nepal, who provided critical information on the U.S. military role and how it conducted logistics. CNA also reached out to UN

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stakeholders providing WASH and POL materiel in Nepal. They helped us identify representative commodities that were needed in the response, that stressed the system, and that would be needed in a scenario similar to that of LOGWAR-15. In particular, we wanted to identify items that:

- Were functionally important;
- Were representative of crosscutting types of requirements;
- Had varying degrees of mobility (i.e., some easy to transport, others more difficult); and
- Presented problems of moderate intrinsic complexity (i.e., neither easy solutions, nor impossible tasks).

The next section of this appendix discusses each chosen commodity, including its characteristics and distribution patterns.

Power generators

At the beginning of the planning process, some stakeholders were particularly interested in using some form of fuel to represent POL. However, CNA wanted to focus on transportable power generation because it is large, presents transportation stressors, and requires liquid fuel to operate. Also, because liquid fuel is a commodity that DOD commonly incorporates in games, CNA wanted to look at POL in a novel way.

General Characteristics of Generators

- Large in size
- Transportation concerns
- Broad functionality
- Widely used by many actors
- Potentially significant quantities needed
- Limited supply of specialized equipment
- Sustained support needed - fuel
- Restrictions on sourcing by IOs/NGOs

In addition, UN personnel working in Nepal during a real-world HADR response identified power generation as a more critical issue. They found that liquid fuel could be procured or sourced, but that power-generation was typically damaged or destroyed by the event causing the HADR, and was therefore in shorter supply than fuel.

Furthermore, generators approved for HADR are in high demand by all actors making them a high-demand stressor for JLEnt operations, as IOs/NGOs, host government actors (such as hospitals), and the military would each draw from a limited stock. Each end user has specific technical requirements for these generators, often due to rugged environments encountered during HADR operations. The UN, for example, has specific generators it approves for use sourced from a limited number of vendors. These units are self-contained, require minimal maintenance, and are built to withstand hard use and handling. Additionally, they are transportable (though they can be quite large), requiring transport for remote areas.

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Ultimately, power generators are in high demand and would stress a JLEnt approach.

Water treatment chemicals

During planning for LOGWAR-15, CNA looked to IOs/NGOs acting in real-world crises to assist in identifying the best WASH commodities. CNA initially looked at water treatment chemicals, water filtration systems, and the direct provision of purified water. Interviews with UNICEF WASH experts operating in crises in West Africa helped direct CNA to water treatment chemicals as the best answer for an HADR response, due to their properties and how they would stress the JLEnt. Bringing fresh water directly to the population is not a sustainable answer, due to the mass and throughput. Water filtration systems were also considered, but were too similar to generators to be of interest. Water treatment chemicals would increase the stress on the JLEnt, not only regarding the large mass needed, but also the particular storage requirements (it is unstable and loses potency over time once the seal has been broken). It also must be kept away from heat, humidity, and direct sunlight, which would be difficult in the tropical climate of LOGWAR-15's scenario. Finally, it has a limited shelf-life; once opened, it must be used within 40 days. These factors would stress the JLEnt, but when we added the sustained large quantities needed to provide water to the population, it was clear that water treatment chemicals were the appropriate commodity to choose.

General Characteristics of Water Treatment Chemicals

- Large in size (shipping container)
- Mass quantities needed
- Strict storage requirements
- Short shelf-life
- Broad functionality
- Widely used by many actors
- Potentially significant quantities
- Mass quantities available

Estimating demand to create realistic scenarios

CNA was given access to the UN Warehouse database. This allowed us to determine how much of the required commodities were on-hand in which UN depots. Because these depots exist worldwide, we was able to estimate transit time, as well. We then determined the long-term sustainability of the commodities by looking at on-hand stocks and vendors' replenishment capabilities. In addition, various UN offices provided information on contacts that provide them with WASH and POL items for HADR efforts. These providers were able to help us determine how much of each item was on-hand and how long it would take to ramp up production if supplies were to run low.

We then merged this data with data on population size, which UNICEF WASH experts provided to model how much of each resource would be required. Because LOGWAR-15 took place on numerous islands (some of them remote), we derived a

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WASH factor for each location. This, along with access and security concerns, drove estimates of WASH chemicals needed for LOGWAR-15.

Power generators were a bit more complex to estimate. While we could estimate the numbers required based on population density and infrastructure requirements (such as hospitals), security became a wildcard. Transportation of some generators by helicopter could be accomplished with relative security. However, the provision of commodities by convoy presented the potential that some of the commodities could be damaged, destroyed, or captured. This would necessitate having replacements on hand. Prioritizing placement of these high-demand commodities was critical, due to the potential for compromise, coupled with the limited throughput of the ports and airfields (see Appendix C).

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Appendix E: Senior Leader Outbrief

This appendix to the LOGWAR-15: Analysis Report summarizes the Senior Leader Outbrief that occurred on 23 July 2015, immediately following the execution of LOGWAR-15. It includes slides presented that day. Below is a list of the senior leaders in attendance:

- **Duncan McNabb**, Gen USAF (Ret.) President, National Defense Industry Association
- **Robert Ruark**, LtGen USMC, Joint Staff, Director for Logistics-J-4
- **Chris Kelly**, Lt Gen USAF (Ret.) Director, Center for Joint and Strategic Logistics
- **John Broadmeadow**, MajGen USMC, Joint Staff, Vice-Director for Logistics-J-4
- **Nadja West**, MG USA, Joint Staff Surgeon
- **John Polowczyk**, RDML USN, Director Logistics and Business Operations - Office of the Chief of Naval Operations N41
- **Stephen Pachuta**, RDML USN, Director Medical Resources, Plans and Policy - N0931
- **Timothy Frye**, Brig Gen USAF, Joint Staff- J-4
- **Mr. Guy Beougher**, Defense Logistics Agency, Executive Director Operations-J3
- **Mr. Dennis D'Angelo**, Deputy Director of Logistics and Engineering, U.S. Central Command (via video teleconference [VTC])
- **John Laskodi**, COL(P) USA, Director, Headquarters Department of the Army, Deputy Chief of Staff, G-4 Strategy and Integration
- **William Kountz**, Col USAF, Associate Director Logistics
- **Anthony Nesbitt**, COL USA, Director/Assistant Chief of Staff for Logistics
- **Alex Zotomayor**, COL USA, Director Medical Supply Chain, Defense Logistics Agency Troop Support (via VTC)
- **Sidney Melton**, COL USA, Chief, Headquarters Department of the Army, Deputy Chief of Staff, G-4 Force Integration and Concepts Capability
- **William Truax**, Col USMC, Director Logistics-J-4 U.S. Southern Command
- **Mr. Lance Carpenter** (via VTC), U.S. Transportation Command-J5S
- **Mr. Larry Pleis**, Chief Logistics Plans and Automation, U.S. Central Command (via VTC)

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- Mr. Nicholas Linkowitz, Headquarters U.S. Marines Corps/Logistics Vision Team.

Introduction and outline

COL Joe Burger, Joint Staff J-4 Capabilities Analysis Division, welcomed the senior leaders to the outbrief and presented the event agenda.

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Logistics War Game 15 (LOGWAR 15)

Senior Leader Outbrief 23 July 15

***COL Joe Burger
JS J4 CAD***

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Agenda



- Welcome COL Burger
- Opening Remarks LtGen Ruark
- LOGWAR Overview COL Burger
- LOGWAR 15 COL Burger
- Player Perspectives Select Participants
- Deliverables COL Burger
- Way Ahead COL Burger

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Opening remarks

LtGen Ruark opened the senior leader outbrief by highlighting that the roots of LOGWAR-15 stemmed from the efforts of General McNabb (former Air Force Vice-Chief of Staff and Director of U.S. Transportation Command, who was present in the room) and the Focused Logistics Wargame in 1998. He noted that these efforts have been an attempt to look into the future to better understand the possibilities of a whole of government approach to complex emergencies. He felt that while LOGWAR-15 was the first in a new series of efforts (and, as such, was intended to be first step in the “crawl-walk-run” evolution), LOGWAR-15 was important as a “thinking exercise” to help shape the way ahead.

LtGen Ruark noted that the Joint Staff J-4 produces a quarterly report assessing the health of various logistical enablers across the U.S. Department of Defense (DoD). These reports highlight that there is some unevenness in our current capabilities, with some doing well, but with others facing notable challenges. Combining this situation with the currently strained budgetary environment stresses the need to consider support from across the entire Joint Logistics Enterprise (JLEnt), particularly drawing capabilities from outside DoD. As part of this conversation, LtGen Ruark highlighted the lessons learned from responses to Super Storm Sandy in 2012 and Hurricane Katrina in 2005.

Finally, he noted that LOGWAR-15, by using a medical focus in the context of a conflict situation, provided the requisite stresses to better understand the strengths and weaknesses of the JLEnt.

Following this overview, he turned the floor back over to COL Burger to take the attendees through a review of the LOGWAR-15 results.

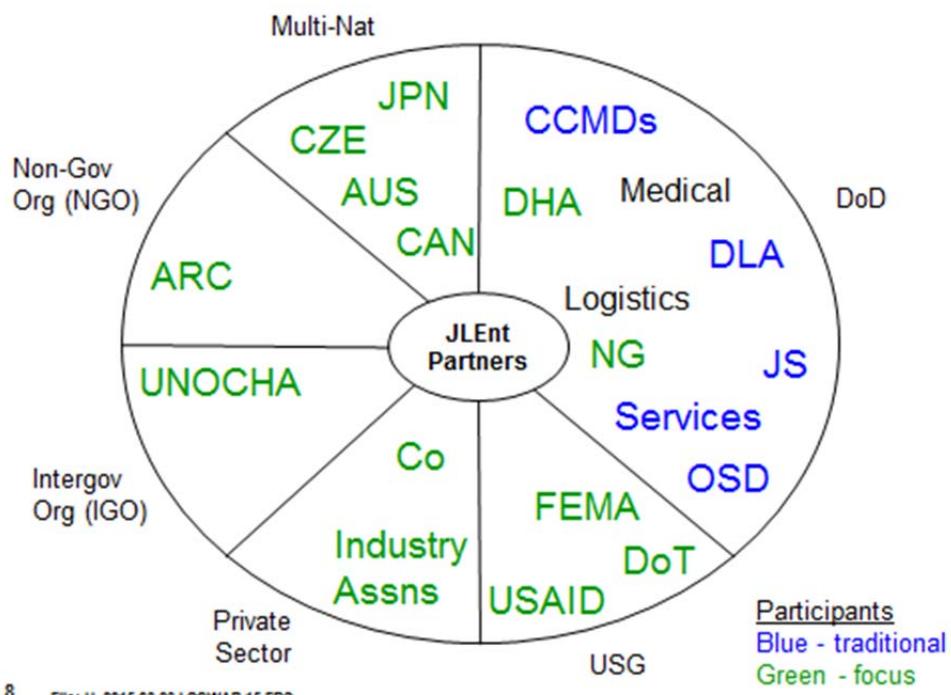
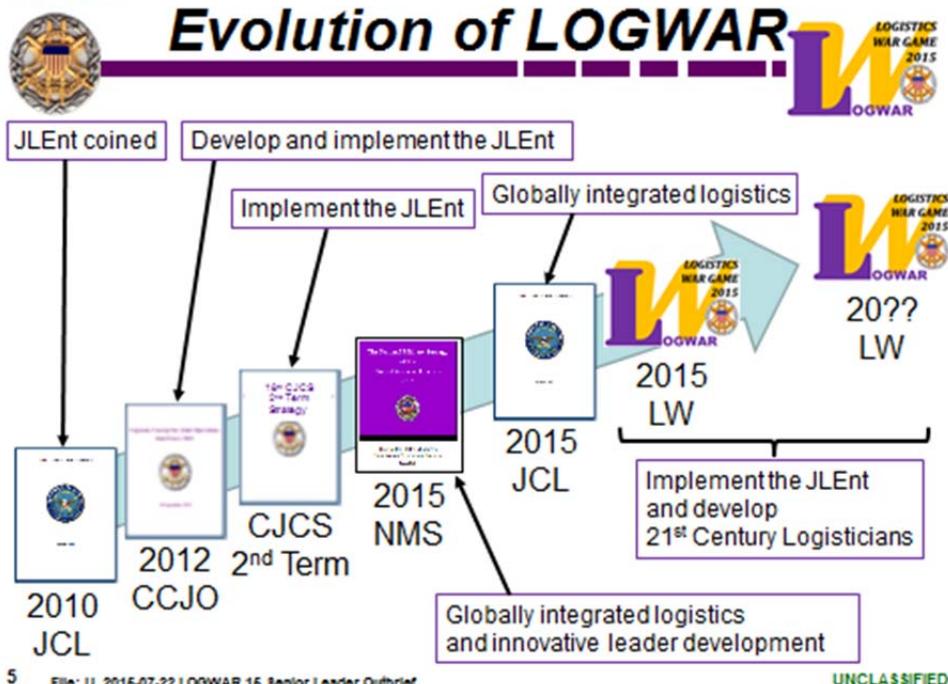
History and trajectory of the JLEnt

COL Burger began by providing a detailed timeline of the development of LOGWAR-15. He emphasized that one of the key outcomes of the LOGWAR series was to implement the JLEnt concept and develop “21st century logisticians.”

COL Burger described the JLEnt as being “a multi-tiered matrix of key global logistics providers and consumers cooperatively structured to achieve a common purpose and bound by an assortment of collaborative agreements, contracts, doctrine, policy, legislation, or treaties designed to make it function in the best interests of the joint force commander.”

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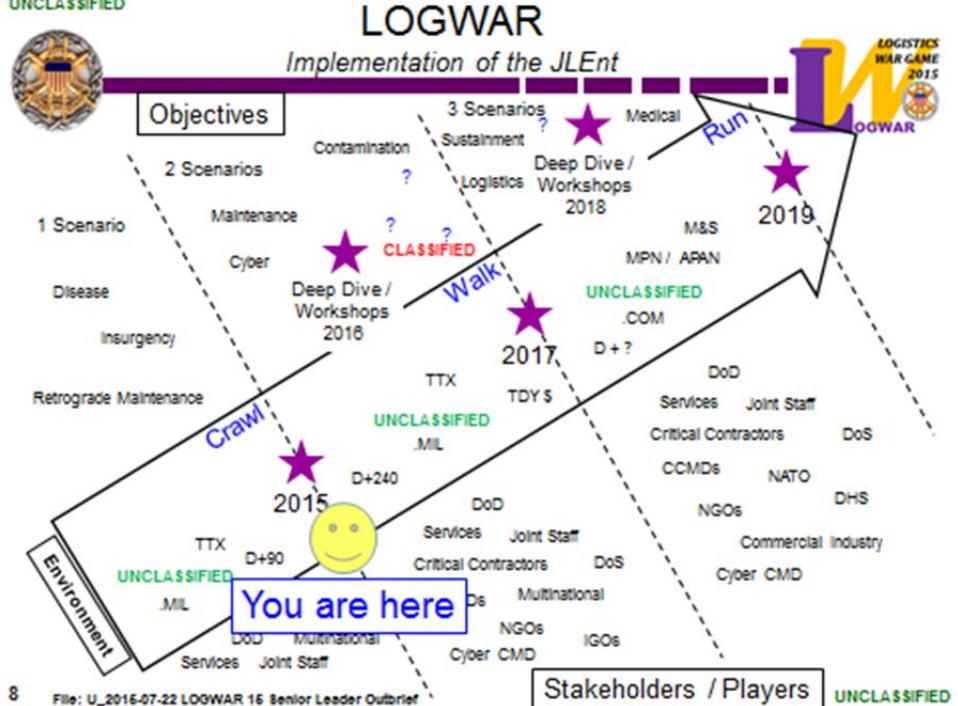


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From there, he described the discussions that had occurred during the planning conferences, wherein the participants had identified six key sectors of the JLEnt approach: DoD, the rest of the U.S. government, international organizations, nongovernmental organizations (NGOs), the private sector, and our multinational allies and coalition partners.

COL Burger then described how LOGWAR was intended to be a biennial series of large forums, with the “off” years focusing on developing the issues identified in previous large forums.

COL Burger noted that the Joint Staff J-4’s intent for the LOGWAR series was to gradually increase the level of complexity, as well as to augment the number and breadth of scope of the organizations included. He also noted that in order to include the full spectrum of participants, the events would need to remain at the unclassified level; specific issues with classified equities could be handled during the off-year efforts.

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LW15 Objectives



- How will the JLEnt support its members in the complex and dynamic environment of the future?
 - What value does the JLEnt bring to operations?
 - How can the Joint Staff and other JLEnt members better leverage the capabilities of the JLEnt?

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LOGWAR 15 Stats



- 2.5 day exercise
- ~ 65 participants
- ~ 35 organizations
- 5 countries (USA, AUS, CAN, CZE, JPN)
- Scenario
 - Simultaneous OCONUS and CONUS events
 - 3 vignettes
 - Insurgency, Disease, Retrograde Maintenance

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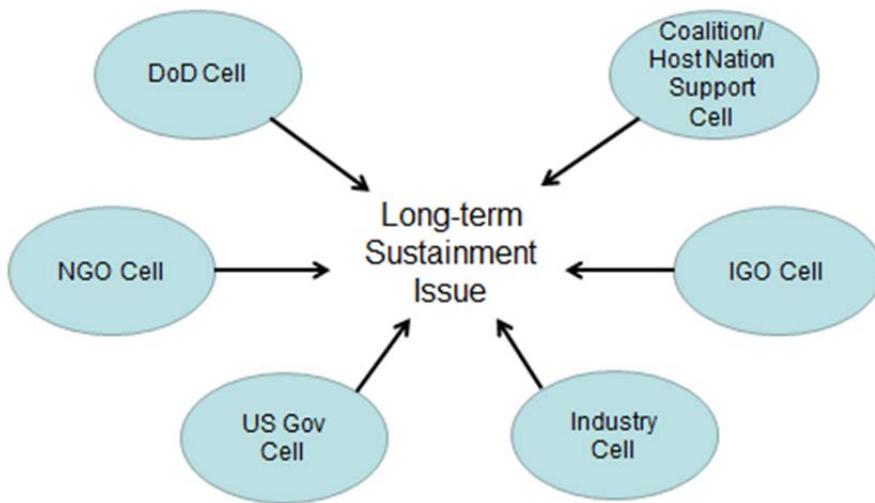
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Perspectives



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Perspectives from across the JLEnt

Given Chairman Dempsey's guidance to implement the JLEnt concept, one of the immediate goals of LOGWAR-15 was to give participants a greater appreciation of the challenges from the perspectives of the other major sectors and to better understand how each group saw the problems that they were being asked to confront jointly. These efforts were intended to support the dual process of understanding and recognizing the value that a JLEnt approach could provide the U.S. military forces, as well as to create a venue where the broader JLEnt community could engage each other on problems that had relevance to the entire group.

Following this, COL Burger described the scope of LOGWAR-15 in terms of duration and participation, noting that the various groups participating were submitting data on the long-term sustainment issues that each felt was most compelling.

At this point, COL Burger invited key members from four of the sectors that participated—U.S. Government, Multinational Allies and Coalition Partners, Industry, and the Department of Defense—to present their findings to the group.

U.S. Government

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**USG**

- **Observations**

- Increased DoD awareness of USG/other capabilities
- Value of bringing stakeholders to the LOGWAR, including providers and consumers.
- JLEnt should communicate their objectives to USNORTHCOM for FEMA-related scenarios.
- LOGWAR should harmonize with ongoing DoD exercise-related events (e.g. JLOTS 2016)



- **Long-term issues**

- De-confliction between HA/DR missions and Combat Support (transport assets, airfields, etc.)
- “Train the way you Fight” (use existing processes as much as possible)

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Mr. John Zavales from the U.S. Agency for International Development (USAID) spoke for the group representing the non-DoD component of the U.S. Government. He

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began by noting that representatives from USAID, the Federal Emergency Management Agency (FEMA), and the U.S. Department of Transportation had all participated and that the broad range of stakeholders had been a good mix. He felt that the LOGWAR-15 environment had given the opportunity for DoD to develop a greater awareness of the capabilities available to it from other parts of the U.S. Government, as well as to create the opportunity to talk about civilian-military relations.

He also suggested that inclusion of U.S. Northern Command (NORTHCOM) in future events would be critical from FEMA's point of view, since FEMA uses NORTHCOM as its primary conduit to request DoD assistance.

With respect to long-term issues, Mr. Zavales discussed the need to deconflict competition for common resources between humanitarian assistance/disaster relief and combat operations. He also suggested building in more up-to-date procedures and processes into future events so that logisticians would have a chance to train using real-world practices.

Mr. Zavales noted the possibility of coordinating with parallel, ongoing events, such as Joint Logistics Over the Shore 2016. Finally, he drew quite a bit of interest from the group regarding his suggestion to create Joint Training Courses.

Multinational Allies and Coalition Partners

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Multinational


- Before:
 - Deliberate planning
 - C2, coord, sync of log effects
 - Agreement & Arrangements
- During:
 - Info sharing
 - Reqs determination & prioritization
 - Supply chain common items
 - Shared services / infrastructure
 - Strategic enablers
 - MN Contracting
- After:
 - Transition to HN / contractor
 - Surge in demand for reset



Col Andrew Maclean (Australia) spoke for the allies/coalition forces group. He began by challenging the idea that the JLEnt represents a new concept. Instead, he offered that the processes and procedures imagined as part of a JLEnt approach already exist, but need to be embraced and implemented more completely.

One large gap that he identified was the inability of the United States' allies and partners to share key aspects of the planning process, due to classification issues. This situation prevents the possibility of performing deliberate planning based on various potential scenarios. He suggested that the selective declassification of certain elements of various operational plans and the overall concept of operations, particularly as relates to coordination and synchronization of logistics, would be beneficial. He also offered that the ongoing development of bilateral agreements and active engagement in various exercises (including ones like LOGWAR-15) would support this process.

From there, Col Maclean discussed what would be required during operations. Information sharing was at the top of his list, and he highlighted the possibility of taking advantage of well-developed social networks to enable this process. He also noted that the lack of a common logistics "language" was a significant impediment. A common terminology would allow for more straightforward prioritization and coordination, which, in turn, would support a more equitable distribution of resources.

Col Maclean noted that for many allies and partners, their militaries were smaller; thus, there would often be no third—or even second—wave of reinforcements. As a consequence, support from the United States with respect to sharing facilities and strategic enablers (e.g., Intelligence/Surveillance/Reconnaissance, Lift) was key to their effective engagement in the response. He noted that the United States should expect its allies and partners to transition out of the response more rapidly than the U.S. would, due to the size of its forces.

The Col also raised the issue of protecting the local economy through the use of a multinational approach to contracting, coordinated with the host country.

He closed by noting that the primary issue of concern is not *what* the JLEnt entails, but rather *who* is in it and *how* it could be used to improve the lives of Soldiers, Marines, Airmen, and Sailors.

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Industry

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Industry



- Objectives
 - What value does the JLEnt bring to operations?
 - How can the Joint Staff and other JLEnt members better leverage the capabilities of the JLEnt?
- Initial observations of LOGWAR 15
- Potential long-term sustainment issues



The Association for Global Logistics & Transportation

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Mr. Cory Cook of Lockheed Martin provided insights from the commercial sector group. He opened with the observation that LOGWAR-15 had brought together a diverse array of logisticians. These disparate groups, in turn, brought their unique knowledge, perspectives, and cultures, which are important components for developing and maintaining a useful and readily available functional base.

Mr. Cook echoed the need raised by other groups for a common language to facilitate collaboration between the various groups. He extended this to include the development of doctrine, where he asserted that the NGO community often did not understand DoD's efforts.

He also noted that current procurement guidelines frequently create complications in the interaction between DoD and industry. In response, he recommended developing a Cooperative Research and Development Agreement or a Board to review, assist, and advise in finding potential solutions.

Mr. Cook agreed with the general sentiment of LOGWAR-15 participants that an important and desirable outcome would be to nurture the network of personal relationships that had emerged from the event. He suggested that more participation by DoD and the U.S. Government in industry conferences would also provide desirable support to the process. He noted that industry already has a significant

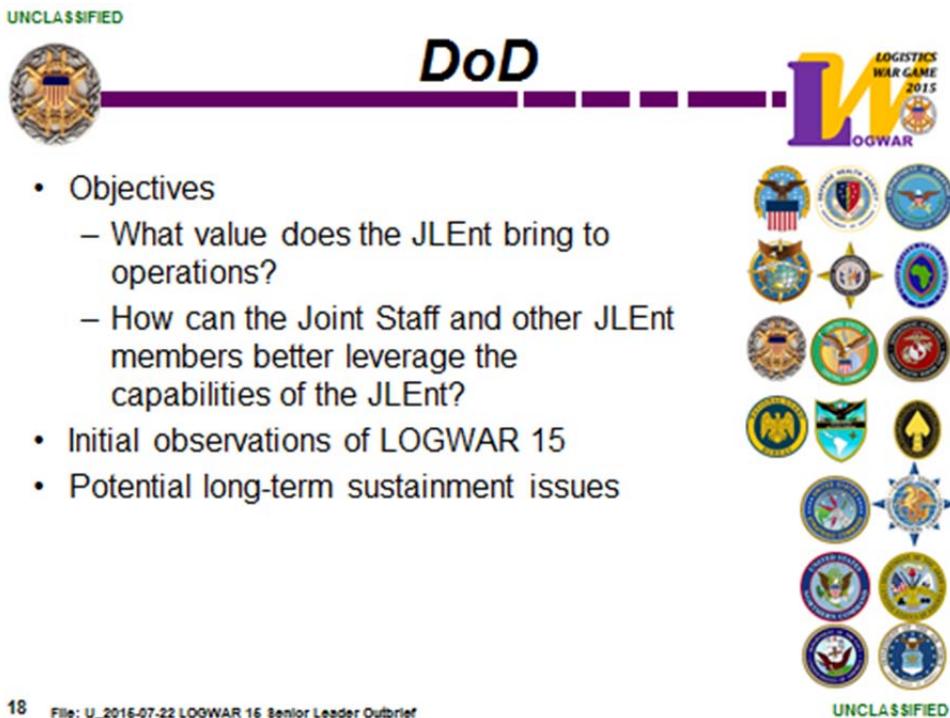
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social networking infrastructure that could be called upon to support the flow of information and understanding across the various sector interfaces, and that this had already occurred in the recent past.

He advanced the concept of an intern program placing DoD personnel into other agencies and sectors that would enable cross-pollination within the various communities. He also felt that industry was positioned to provide the government with more assistance with research and development, but that industry needed government partners to initiate the interaction.

Mr. Cook closed his remarks by discussing two issues related to long-term sustainment. The first centered on the limited capacity for maritime transport that was native to the United States. With only six companies and one percent of the worldwide fleet under a U.S. flag, the United States is dependent upon non-U.S.-flagged carriers to keep up with the demand. While there are mechanisms in place to use non-U.S.-flagged ships, he felt that it was important to provide incentives for the owners of U.S. international shipping companies to use U.S.-flagged ships. The second issue returned to a topic raised frequently during LOGWAR-15, which was the lack of standard nomenclature for identifying and locating resources in theatre.

U.S. Department of Defense



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The DoD group split its comments into two categories: logistics and medical. Mr. Laine Krat, U.S. Air Force AF/A4LX, went first and presented the insights from the logistics perspective. He began by noting that there was wide representation from across DoD, including the National Guard, and that this broad base of support is necessary to enable and sustain the warfighter.

LOGWAR-15 helped to bring people together who need to communicate if a JLEnt approach is to be successful. From this, though, key issues emerged concerning how to maintain and disseminate the knowledge developed from the event. Supporting more engagements like LOGWAR-15 provides an answer for the short term. For the long term, the community needs to develop a framework for communication.

Mr. Krat also felt that because of the diversity of the logistical community, there was no single solution. He expected that each member of the community would be acting under notable and increasing internal stresses, ranging from budgetary uncertainty and operational demands, to aging capabilities and increasingly complex environments. In response, the community needs to be encouraged to develop tailored solutions free from micromanagement, but with DoD providing some limits and guidance.

Finally, Mr. Krat thought that guided support of innovative technologies (e.g., additive manufacturing, automation/robotics, miniaturization, and modularization) would be important contributors to success.

Following this discussion, LTC John Evans, Joint Staff J-4 Health Services Division, spoke on the medical aspects of LOGWAR-15. He opened by pointing out that while LOGWAR-15 had brought together many key actors within the international community, NGOs, and industry, there were still many partners missing from industry (WALMART, Target, Home Depot), NGOs (Médecins sans Frontières), and key international organizations (International Red Cross, UNHCR). Reaching out to these actors is critical to progressing. In addition, he saw the integration of industry into the overall JLEnt approach as a key enabler for solving issues such as gauze shortages, by addressing the problem of excess bureaucracy.

He noted that during LOGWAR-15, it became clear how difficult it is to separate the medical response components from aspects of healthcare, and suggested including more representation of the healthcare community in future efforts.

Moreover, LTC Evans felt that one of the key achievements of LOGWAR-15 was the propagation of the awareness that DoD is thinking in terms of JLEnt approaches to contingencies. In addition, the venue served as an important vehicle for training young officers, particularly in the area of organizing. LOGWAR-15 also provided an opportunity to develop and enhance DoD's collaboration with multinational partners.

LTC Evans closed his remarks by identifying several areas where he still felt there were significant challenges to overcome, including:

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- Defining the *how* and *who* of managing a JLEnt response;
- Gaining better understanding of industrial capacity and how to build and support a robust capacity for items such as antidote treatment-nerve auto-injectors;
- Addressing various regulations that impede DoD's ability to source requirements; and
- Effectively incorporating various actors in the international community.

He concluded that effective collaboration is about self-interest. Each contributor needs to be able to understand how it benefits from an engagement and how its efforts then support partners.

Roundtable discussion

At this point, **LtGen Ruark** opened the floor to comments and discussion. He began by inviting **Gen McNabb** to comment on his perspectives. Gen McNabb opened by saying how important the LOGWAR effort is. He was encouraged that the participants had grappled with the questions of who was in charge and how they would organize.

Gen McNabb further noted that LOGWAR provides a framework for rapid response to emergent situations that does not afford the luxury of delayed responses. While he felt that the United States does expeditionary logistics better than anyone else in the world, he pointed out that joint logistics is so broad that it is difficult to fully encapsulate what is required.

The General continued by pointing out that while the legal and financial aspects of a coordinated response are important due to issues of accountability and obtaining reimbursements, saving lives is more important.

Gen McNabb was pleased that LOGWAR-15 was beginning to address the shortfall in the number of venues available for the DoD sector to engage with industry, NGOs, and other potential partners. These sectors provide critical capabilities, and developing trust with them (as happened in the response to the Haiti earthquake) is the key to success. He noted that actors such as Target and Walmart can bring a lot of stock quickly to a crisis, and that this then provides needed support to the combatant commander. He offered that he thought that DoD could learn a lot from industry, and that the LOGWAR initiative was a potentially valuable forum to better understand how to utilize available resources.

Following these remarks, **LtGen Kelly** posed several questions to the group. First, given the expressed desire for even more engagement, he wondered if there were other opportunities for the logistics community to interact, especially during the off-years of the LOGWAR effort. Next, he challenged the group to improve the

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introduction of JLEnt ideas through training of the current and next generations of logisticians, both in and out of uniform. The goal is to avoid propagating outdated methods and approaches and to incorporate the JLEnt mindset as a foundational aspect of their development. Lastly, **Lt Gen Kelly** argued that keeping the deliberate planning process completely shielded from the United States' international partners makes no sense for logistics. The issue then becomes, how does the United States develop agreements with its partners that both inform them about our likely needs and engender trust that we will be there to support them?

From there, **MG West** noted that the increased complexity of the LOGWAR initiative would help all of the various participants to highlight a wide range of issues. She felt that the visibility into the second- and third-order effects of the United States trying to do things by itself, as well as the interactions between different commodities, were important aspects that had not previously been articulated.

RDML Polowczyk described the U.S. Navy's efforts in this arena (specifically the Office of the Chief of Naval Operations' logistics-centric game, and other efforts) and wondered how these efforts could be propagated to a wider audience, specifically the "Five Eyes" (Australia, Canada, New Zealand, United Kingdom, and United States), or even a fully unclassified environment.

Mr. Beougher noted that, in the last 12 months, the demand signal from world crises had been comparatively light. What "kept him up at night" was trying to understand how to prioritize and manage multiple crises simultaneously; what if the past two years of contingencies were all to occur within a six-month span?

LtGen Ruark interjected, noting that the LOGWAR scenario stressed DoD's ability to respond, which forced DoD to rely on nontraditional support. He looked forward to better understanding how DoD would support FEMA in the context of a domestic emergency.²⁴

Brig Gen Frye suggested that including representatives from domestic utilities would add value. A recent conference on the security of the electric infrastructure had highlighted potential vulnerabilities, and their participation could offer useful partnerships.

Mr. D'Angelo was concerned that the United States would need to move even faster than what the LOGWAR timeline outlined. The value of a JLEnt approach is being articulated every day, and the United States needs to put processes in place to move forward, delivering better information sharing and training as quickly as possible. He suggested using the upcoming Conference of Logistics Directors—as well as face-to-face interactions between the combatant commanders and the Joint Staff's J-4 guidance—to advance the process more rapidly.

²⁴ This will nominally become a significant focus of LOGWAR-17.

COL Burger summarized the way ahead, including the deliverables scheduled to come from LOGWAR-15.

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Deliverables



1. Document with JLEnt long-term sustainment challenges
2. Potential logistics topics for academic study
3. Forum to develop and train 21st Century Logisticians
4. Forum for sharing information and building relationships
5. Inform logically feasible plans

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Way Ahead



- Sep 2015 - LOGWAR 15 Report
 - Recommended issues for further study
- FY16 Events
 - 1-2 deep dives
 - 1-2 workshops
- Further development of CONUS scenario
- LOGWAR 17 - execute in Spring 2017
 - Planning starts Spring 2016

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LtGen Ruark called the meeting to a close. He liked the idea of moving ahead with all due speed, and asked the various groups represented to provide inputs for the off-year efforts described in the LOGWAR initiative. In particular, he highlighted the themes of communication and coordination. With that, he gave his thanks and adjourned the meeting.

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Appendix F: Participant List

This appendix to the LOGWAR-15: Analysis Report lists the external (non-CNA) participants for LOGWAR-15. Each listing includes the person's real-world position/affiliation and his or her nominal role in the game (provided in parentheses).

Nongovernmental organizations

- **Mr. Bill Malfara**, American Red Cross (Red Cross)

International organizations

- **Ms. Lauren Kajczak**, United Nations (UN-Mission)
- **Mr. Michael Marx**, United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA)

Industry/Commercial sector

- **Mr. Corey Cook**, Lockheed Martin (Individual Companies)
- **Mr. Jeff Earley**, National Defense Industrial Association (Industry Associations)
- **Mr. Wally González**, Crowley (Shipping)
- **Mr. Michael Hopmeier**, Unconventional Concepts (Individual Companies)
- **Mr. Paul Karafa**, Troika Solutions (Individual Companies)
- **Mr. Chad Nelson**, Tropical (Shipping)
- **Mr. Joe Spruill**, National Defense Industrial Association (Industry Associations)
- **Mr. Jon Veditz**, National Defense Industrial Association (Industry Associations)

Allies

- **COL Andrew Maclean** (Australia), Joint Staff J-4 Liaison Officer AUS (Korona)

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- **LTCOL James McGrath** (Canada), Joint Staff J-4 Liaison Officer CAN (Canada)
- **LTC Patrick Murray** (Australia), USA Combined Arms Support Command (Coalition Partner)
- **LTC Pavel Rys** (Czech Republic), Foreign Liaison Officer CZE (Coalition Partner)
- **Col Hayashi Yasamura** (Japan), J7 Foreign Liaison Officer JPN (Coalition Partner)

U.S. government

- **LtCol Grant Izzi**, Office of the Secretary of Defense, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Supply Chain Integration (OSD)
- **Mr. Peter Petrelis**, Joint Staff J-4 Department of Transportation Maritime Administration (DOT)
- **Mr. Lee Plowden**, Office of the Secretary of Defense, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OSD)
- **Mr. John Reardon**, U.S. Department of Transportation (DOT)
- **LTC Robert Weir**, U.S. National Guard J-4-PE (NG State Partnerships)
- **Mr. John Zavales**, U.S. Agency for International Development (USAID)
- **Mr. Bill Zellars**, Federal Emergency Management Agency (FEMA)

U.S. Department of Defense

- **Mr. Andre Batson**, Defense Logistics Agency Joint Contingency Acquisition Support Office (DLA)
- **Mr. Peter Battaglia**, Defense Logistics Agency Class VIIA Medical Materiel Executive Agent (DLA-LNO to Industry)
- **Mr. James Carr**, U.S. Navy Bureau of Medicine and Surgery Combat Development and Integration (JFMCC)
- **COL Scott Chambers**, U.S. National Guard J-4-SP (National Guard)
- **Lt Col Neil Christensen**, U.S. European Command ECJ-45-PLEX (EUCOM)
- **Mr. Vincent Chustz**, Defense Health Agency Healthcare Operations (DHA)
- **COL Derek Cooper**, U.S. Army 6th Medical Logistics Management Center, Commander (JFLCC)
- **Mr. Len Duffy**, Joint Staff J7 Multi-National Allied Command Transformation Integration Division (LNO to Allies)
- **LTC John Evans**, Joint Staff J-4 Health Services Division (J-4)

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- **Mr. William Funches, Jr.**, Headquarters, Department of the Army, Deputy Chief of Staff, G-4 (USA)
- **Mr. Hans Garcia**, U.S. Southern Command SCJ-4 (SOUTHCOM)
- **LCDR Rebecca Gels**, U.S. Navy Office of the Chief of Naval Operations N41 (USN)
- **MAJ Melissa Gue**, Headquarters, Department of the Army Office of the Surgeon General (JFLCC)
- **CW4 Catherine Harder**, U.S. Army 6th Medical Logistics Management Center (TSC/EC)
- **LCDR William Paul Harris II**, Joint Staff J7 Multi-National Allied Command Transformation Integration Division (J7)
- **Mr. Bill Hartmann**, U.S. Navy Medical Logistics Division Navy Medical Logistics Command (JFMCC)
- **Mr. Joseph Indelicato**, U.S. Transportation Command (TRANSCOM)
- **Mr. Jonathan Kissane**, U.S. Army Medical Command, Medical Research and Material Command (TLAMM)
- **Mr. Carl Knotts**, Defense Logistics Agency J311 Exercises (Observer)
- **Mr. Laine Krat**, U.S. Air Force AF/A4LX (USAF)
- **Mr. Mark Lampert**, Headquarters, Department of the Army Deputy Chief of Staff, G-4 (USA)
- **Lt Col Justin Lavadour**, U.S. Transportation Command (TRANSCOM)
- **Mr. Richard Lliteras**, U.S. Central Command J-4-S (CENTCOM)
- **MAJ Aaron Mallory**, U.S. Army 6th Medical Logistics Management Center (JFC)
- **LTC Peter Markot**, Headquarters, Department of the Army Office of the Surgeon General (USA)
- **CAPT Carla Meyers**, Defense Logistics Agency Joint Contingency Acquisition Support Office (DLA)
- **Dr. Joseph Mickiewicz**, Headquarters, U.S. Marine Corps Installations & Logistics Logistics Vision and Strategy Branch (USMC)
- **MAJ Cassandra Mims**, Defense Health Agency Medical Logistics Division (DHA)
- **Lt Col Patrick Misnick**, U.S. Air Force, Air Force Medical Operations Agency/ SGALW (TLAMM)
- **LCDR James Nogle**, U.S. Navy Bureau of Medicine and Surgery Combat Development and Integration (USMC)
- **Mr. Michael O'Connor**, Defense Logistics Agency Troop Support (DLA)
- **Mr. Vincent Pontani**, Headquarters, U.S. Marine Corps (JFMCC)
- **Mr. Will Porter**, U.S. National Guard-J-4-PE (National Guard)
- **LCDR Charles Reed**, U.S. Navy Office of the Chief of Naval Operations N413 (USN)

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- **LTC Christopher Robertson**, U.S. Pacific Command (JFC)
- **Mr. Kevin Ross**, U.S. Northern Command/North American Aerospace Defense Command-J-43ORAD-J-43 TREX (NORTHCOM)
- **Lt Col Schlevensky**, Defense Logistics Agency J34 (DLA)
- **Maj Michael Scott**, U.S. National Guard J-4 (National Guard)
- **Ms. Mary Stevenson**, U.S. Air Force AF/A4LM (USAF)
- **CPT Brenda Sumner**, U.S. Army 6th Medical Logistics Management Center (JFC)
- **Mr. Alex Taag**, U.S. Navy Naval Medical Logistics Command (JFMCC)
- **LCDR Ayessa Toler**, U.S. Navy Bureau of Medicine and Surgery Combat Development and Integration (JFMCC)
- **Ms. Marissa Walker**, Defense Logistics Agency Troop Support (DLA)
- **MAJ Brendon Watson**, U.S. Transportation Command Surgeon (TRANSCOM)
- **Col Dwayne Whiteside**, Joint Staff J-4 Capabilities Analysis Division (J-4)
- **Mr. Tom Wieczorek**, Headquarters, Department of the Army Office of the Surgeon General (JFC)
- **Mr. George (Skip) Williams**, Headquarters, Department of the Army, Deputy Chief of Staff G-4 (USA)
- **Mr. Cesar Valdesuso**, Headquarters, U.S. Marine Corps, Installations & Logistics, Logistics Policy and Capability Branch (JFMCC)
- **Mr. David Via**, U.S. Air Force, Office of the Surgeon General, Medical Logistics Division (JFACC)

Appendix G: Participant Surveys

This appendix to the LOGWAR-15: Analysis Report is a compilation of responses from a survey given to LOGWAR-15 participants immediately following the event. The survey asked three questions:

- How can we better shape the next LOGWAR event in order to address your organization's equities?
- What are the long-term sustainment issues you would like addressed during the deep dives and/or workshops in FY16?
- Other comments?

We received 22 responses from 76 participants, which we have broken into the following corresponding sections:

- Suggestions for the next LOGWAR event
- Issues of interest
- General observations.

All comments are transcribed (unedited) below. To make the feedback accessible to all Joint Logistics Enterprise (JLEnt) partners, acronyms and abbreviations have been defined in footnotes on first use.

Suggestions for the next LOGWAR event

- “Instead of vignettes with a lot of ‘assumptions,’ allow the team the time to run the scenario through the current proven, and then the opportunities to improve will become evident. With so many players, there are different ideas of how it should be done. A leader from the joint staff and/or COCOM²⁵ or

²⁵ Combatant Command.

USAID²⁶ should facilitate. Too much inefficiency allowing us to ‘self-organize’ that wasted too much time.”

- “Joint Concept for Logistics (JCL) proposes a concept for how JLEnt could support globally integrated operations. Global operations include JLEnt operations in CONUS²⁷. LOGWAR 16 needs to include JLEnt operations in CONUS along with OCONUS²⁸ OPs²⁹. The JLEnt concept is entirely different between CONUS and OCONUS OPs. LOGWAR 16 should focus on one of the U.S. National planning scenarios.”
- “Do an actual walk-through a vignette to include sourcing lift (air/sealift) and costing out a movement request. For example moving 20 tons for USAID – have an actual MITAM³⁰ and figure out how much TRANSCOM³¹ charges and walk through the booking process. Limited assets movement, low volume and low frequency of cargo are a huge issue for several COCOMs.”
- “I think less vignettes are good to discuss.”
- “Two or more phases for a vignette will be better.”
- “Collaboration with IGO/NGO’s³² similar event/educational course.”
- “Making LOGWAR a regular event (annual).”
- “MEDLOG: how will the supply chain look (AF vs. Army)? What system will be used (DMLSS³³ vs. TWELS³⁴)? Requisition process? Prepo? HA/DR³⁵. How does/should MEDLOG³⁶ interface w/ USAID and other agencies? What scenarios can be expected and how should they be mitigated.”
- “Outstanding forms that allowed, at least for me, an ability to see everyone in the game and what they bring to support, and their role. Look forward to solidifying the JLEnt concept in the months to follow.”

²⁶ U.S. Agency for International Development.

²⁷ Contiguous United States.

²⁸ Outside the Continental United States.

²⁹ Operations.

³⁰ Mission Tasking Matrix.

³¹ U.S. Transportation Command.

³² International Governmental Organization/Nongovernmental Organization.

³³ Defense Medical Logistics Standard Support.

³⁴ Theater Enterprise-Wide Logistics System.

³⁵ Humanitarian Assistance and Disaster Relief.

³⁶ Medical Logistics Division.

- “Establish information portal for collaboration early. Perhaps even a standing LOGWAR portal.”
- “Focus on operational and strategic issues (well done!)”
- “Build on/integrate with DLA³⁷ war games (fuel, med, etc.).”
- “Rather than the gamebook, have other documents, doctrine, etc...identified for read ahead so folks are familiar with current structures so we don’t try to recreate the wheel (i.e., log clust, JRRB³⁸, etc...)”
- “Instead of an artificial problem (next game) execute LOGWAR as a case study.”
- “Role-playing is an effective and useful tactic for learning, but DoD³⁹ did not get to the point of actual role-playing to make this effective. There are too many roles and missions within DoD to treat it monolithically. The vignette managers needed more tools to reinforce the role-playing aspects, e.g., role cards that specify duties, responsibilities, desired outcomes, etc., geographically place players in the room, pinging key players for milestone progress (e.g., the JFC⁴⁰).”
- “Non-conflict scenario as this creates a very different relationship between IOs⁴¹ and the U.S. military. There is more collaboration during a strict HADR⁴². If it is conflict there are too many restrictions on UN,⁴³ etc., legal issues.”
- “LOGWAR needs to be a true wargame to test the JLEnt concept:
 - Shrinking resources (\$)
 - Availability of capabilities (majority of sustain in RC⁴⁴)
 - Adaptive logistics
 - Enterprise wide/global visibility of the supply chain
 - Appropriate audience
 - Clearly defined roles for players
 - Better task organization of cells.”

³⁷ Defense Logistics Agency.

³⁸ Joint Requirements Review Board.

³⁹ U.S. Department of Defense.

⁴⁰ Joint Force Commander.

⁴¹ International Organizations.

⁴² Humanitarian Assistance Disaster Relief.

⁴³ United Nations.

⁴⁴ Reserve Component.

- “Structure the LOGWAR 17 to address/focus at the theater strategic, national strategic level; this event focused too narrowly on the tactical level by its design.”
- “For the FY16 events, concrete objectives should be established well enough in advance to allow participating organizations to prepare appropriately (does not imply this event wasn’t done this way, just a focus for the next events)”
- “For next LOGWAR, establish a roster of positions and make sure there’s a player filling each slot. Especially NGOs, IGOs. Too many DoD’s; limit next time be sure different echelons are filled but not overfilled.”
- “For the National Guard, the CONUS operations helped to identify some capability sourcing issues, but the OCONUS operations were the focus of vignettes such that we never really talked about the sourcing challenges for the DSMA⁴⁵/DOMOPS⁴⁶ scenario, when the NG⁴⁷ is more in the lead than DoD (but not “in charge”). NORTHCOM⁴⁸ was never really highlighted as a supported command as PACOM⁴⁹ was. This is key for next time: give NORTHCOM some primacy in the vignette, and the NG will be more able to play its part. The NG State Partnership Program could be more embedded in the vignette.”
- “Have each org bring a flow chart of their requirements-development-to-execution process. It would be interesting/instructive to see how they differ or are similar.”
- “Conduct JLEnt LOGWAR exercises on an annual basis. MUST keep momentum on working the “inter-agency” collaboration.”
- “Ask every org to bring a list of training venues that they use: schools, courses, etc.—conferences, seminars, workshops, etc.”
- “Use actual problems for discussion rather than make up a scenario and use LOGWAR as a method to drill into them and brainstorm.”
- “Have a session where cells are integrated purposely to force cross talk.”
- “Fewer DoD role players but more focused attendees.”
- “Focus on solutions versus discussing – Facilitated structure shipping group output to specific analysis objectives ‘leverage linkage to ‘other’ venues i.e.,

⁴⁵ Defense Security Cooperation Agreement.

⁴⁶ Domestic Operations.

⁴⁷ National Guard.

⁴⁸ U.S. Northern Command.

⁴⁹ U.S. Pacific Command.

Iron Crucible, Turbo Transition, ET.AL. which address global integrated operations that can examine Global Integrated Logistic (GIL); leverage MCDC⁵⁰ program to develop LOG solution.”

- “Organizing by organization is natural and reflects our legal/fiduciary accountabilities. However, it’s only partially effective for learning and mission accomplishment. We need to acknowledge that there are at least two other ways to organize people: 1) by community of interest (log, med log, practitioners, engineers, etc.) and 2) by their role in requirements-development-to-execution process; at its most basic (over-simplified) form, people will fall into one of three role brackets:
 - Force providers: services, DLA, industry, coalition partners (capability owners)
 - Adjudicators/coordinators: UN, TRANSCOM, JCS⁵¹, FEMA⁵² OFDA⁵³
 - Executors (requirement owners): JFC, contractors,
 - Most organizations have divisions that fall into 2 or 3 of these buckets, for a TTX⁵⁴, would there be value in putting all the force providers – across all orgs – together? This would bring a process focus versus an org-focus. We don’t want to confuse ‘organizations’ with ‘roles’ (see pg. 29 of gamebook).”

⁵⁰ Marine Corps Combat Development Command.

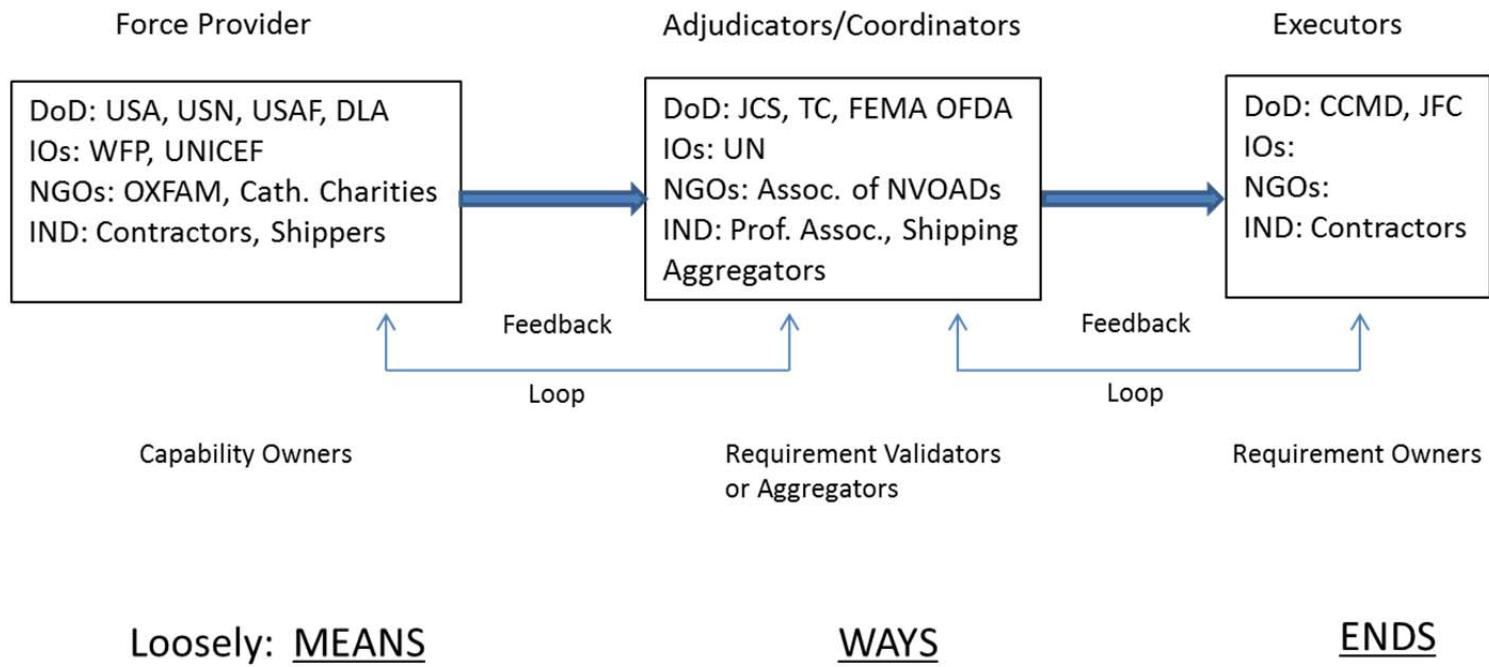
⁵¹ Joint Chiefs of Staff.

⁵² Federal Emergency Management Agency.

⁵³ U.S. Office of Foreign Disaster Assistance.

⁵⁴ Tabletop Exercise.

Figure G-4. Organizing by Organization



Issues of interest

- “Information/Data exchange between all ‘members’ of the JLEnt - develop approach to interfaces that allow appropriate classification.”
- “Promotion and advertising existing systems/forums for collaboration (i.e., relief web.int).”
- “Data standardization between the services and also interagency/IGO/NGOs.”
- “Education/training of JLEnt members.”
- “Sustainment of critical industrial “skills” and artisans.”
- “Vulnerability of logistics/sustainment networks.”
- “Common JLEnt ‘lexicon’- standard naming conventions.”
- “Funds for investment in long-term O+S costs for WPN systems.”
- “Consider exercising the ‘Material enterprise’ with JLEnt. Continue to integrate Trade Association and Industry forums into the JELnt and LOGWAR workshops and LOGWAR exercises.”
- “Incorporate the UN Cluster System into the discussion (existing means of coordination before JLEnt) and differentiate between Cluster System/JLEnt.”
- “Mission Partner Environment and its implications on the advancement of Globally Integrated Logistics / JLEnt.”
- “Clearly define the JLEnt - what is it?”
- “JLEnt member improved information sharing; logistics planning in steady stage, incorporate FMN⁵⁵/MPE⁵⁶ in JLEnt logistic planning in terms of logistics information networks (asset visibility/COP⁵⁷). * JSJ-4 should consider using the JSJ7 MCDC program as valued resource to work appropriate MN partner solutions as sponsor/key stakeholder; i.e., Joint Coalition Integrated Distributed Operations (JCIDO) in coordination with USTRANCOM and a

⁵⁵ Future Mission Network.

⁵⁶ Mission Partner Environment.

⁵⁷ Common Operating Picture.

regional GCC⁵⁸ (Abstract Development begins Jun 2016). ** MCDC 2017-2018 theme is: Rapid Aggregation of Forces.”

- “Define JLEnt whether it’s a concept or an entity.”
- “Devine what a fully functional JLEnt looks like and how it operates”
- “Define/identify how the JLEnt supports the commander”
- “No leader may possibly be better, if all members have mutual trust without dependency in their mind, I think.....”
- “Do not seek any answer, but desire a something new as a common output.”
- “Within the JLEnt, I perceive we are only at the acquaintance/relationship/mutual org knowledge level-how do we evolve to actual & effective partnerships?”

General observations

- “The usage of the Wargame scenario in LOGWAR 15 led to many of the conversations delving into tactical level. As the sessions were explained as looking at the operational and possible strategic level, it might be worthwhile to reorganize the scenario. Admittedly we didn’t go so far as ‘moving pieces on a map,’ but we didn’t get to the long-term sustainment issues until the midday point of the event.”
- “Long term sustainment issues are difficult to accurately predict. Each disaster scenario will require a reaction and may not warrant development of plans. If we know of issues, we should already be mitigating or correcting them. This exercise shouldn’t be the place to bring them to light.”
- “Overall a very informative event, it will be very important that the ‘lessons written’ from this event actually become lessons learned though application and adjustment.”
- “Narrow focus on niche logistics/sustainment issues seems to have narrowed participation (large # of ‘medical logistician’ without participants focus service MACOMs AMC, MARLOGCOM⁵⁹, etc.) to small communities of interest”
- “If the purpose of this event was to sell the idea of the JLEnt, it was bad. If the intent was to gather the desired capabilities that the JLEnt needs to

⁵⁸ Geographic Combatant Commander.

⁵⁹ Marine Corps Logistics Command.

support it was great. 1) to improve, clearly identify what your goal is 2) provide a person per group to answer any questions the group has 3) if you start at day XX, you need to provide the structures that would be there. Solve with step 2.”

- “To ask for participation not only single country representation but also representation from NATO⁶⁰ and/or EU⁶¹”
- “To engage Multinational Logistics Coordination Centre (MLCC) into this game series” (www.mlcc-eng.army.cz)
- “Complex emergencies that go on for a longer timeframe - what will DoD’s role be in these when we are talking about years.”
- “Address three key issues - generating requirements, sourcing requirements, and delivering requirements not just first two”
- “Interoperability”
- “How do you deconflict priorities, requirements, and transport?”
- “Do not see contracting or other stakeholders within JLEnt as a panacea.”
- “Spend the 1st half day of the conference with each play/organization given a 5/10 expert on their organization mission and capability so we know who the players are, set table up where a representative from each group sits at the table to force interaction.”
- “Asset visibility. Bring key players in early on during the planning process instead of at the execution phase. How do we educate the individual at the tactical level the lesson learned?”
- “After long term sustainment issues have been identified have team go back and develop solution or course of action to minimize the negative effects.”
- “Expeditionary maintenance of combat system platforms”
- “Reconstitution of preposition equipment, material, op project stocks”
- “Host Nation, Partner, Ally sustainment”
- “Health Service Support to DoD service personnel/beneficiaries during major regional/contingency”
- “The bespoke scenario takes too long to understand. Perhaps use the standard Defense planning scenarios with modification”

⁶⁰ North Atlantic Treaty Organization.

⁶¹ European Union.

- “DoD needs to be better organized. Perhaps CCMD⁶², JTF, LOGCC and revise log and groups. Use reps from these groups to facilitate.”
- “Include MN (coalition) partners early in the planning to include involvement in upfront analysis/research to inform article to be examined (JLEnt/JCL). Focus on solutions to problems (challenges, issues, capability needs, etc.); use analytical wargame approach to provide specific answers to inform/assess/evaluate/validate some means/ways to resolve a problem set – Access MN partners at Joint Staff- J7 MACT⁶³ Integration Division in Suffolk, VA (POC⁶⁴: Len Duffy) * Less scenario/vignette general of condition; more stimuli for analytical based discussion.”
- “NGOs/IOs need to be part of the planning and not just invited to the game. Incorporate Cluster System.”
- “Not sure how this solves problems or if that is what it is for....”
- “Raise the level of the Concept to look at a (DPS⁶⁵) ‘Scenario-Level’ event – high level CONOPs⁶⁶ only. This will force participants to look at strategic and operational issues vice diving to the grass-roots tactical level. Engage DOS⁶⁷ to develop a USG⁶⁸ ‘Goal or Aim’ for the scenario.”
- “Less focus on scenario”
- “For some sessions (Break-out) mix groups with DoD, USG, IO, NGO and Intl reps”
- “Look at operation in phases to consider different equities of each org as OP is planned and executed.”
- “Bulk liquid distribution”
- “Low volume/low frequency”
- “Multinational contracting”
- “Mechanisms for coordination/synchronization”

⁶² Combatant Command.

⁶³ Multi-National Allied Command Transformation.

⁶⁴ Point of Contact.

⁶⁵ Defense Planning Scenario.

⁶⁶ Concept of Operations.

⁶⁷ U.S. Department of State.

⁶⁸ U.S. Government.

- “JLEnt WIKI page”
- “Link to TRANSCOM turbo transition”
- “DoD cell: Build a more structured approach – form a GCC functional “staff” with “components” and POLAD⁶⁹/NGO LNOS.⁷⁰”
- “Engage OGAs⁷¹: Focus scenario so that another agency has the lead (DOS/DOT⁷² etc.)”
- “Identify elements and relationships of the logistics whole community approach in support of FEMA in a domestic disaster response.”
- “Associate DoD theater distribution plan and impacts on CONUS and OCONUS natural disaster and OCONUS military operations.”
- “Determine force structure and sourcing requirements needed to support CONUS operations and movement requirements.”
- “Develop concept of support for medical logistics commodities that are required to support DoD forces in a CONUS disaster. Note: Based exercise Org and C2 structure on real-unclass CONPLANS.”
- “The organization equities are met. I think the JLEnt is a concept of team work and information sharing. Each service/entity logistics team serve THEIR own boss. If we can work together, we generally will, but we support our mission first.”
- “The discussions were helpful but we should be ready in situations to collaborate that appears to be the true outcome of the discussions.”
- “Is LOGWAR meant to focus solely on logistics-or also engineering? Wasn’t clear.”
- “Industry ability to surge on certain commodities-perhaps reps from Raytheon, etc. can be represented.”
- “Phase 0-3 operations where expectation of adversary interdiction mirrors the TPFDD⁷³ and where consumption occurs in the midst of battle. Consumption, repair, commercial support, NGO interaction are all played out

⁶⁹ U.S. Department of State Foreign Policy Advisors.

⁷⁰ Liaison Officers.

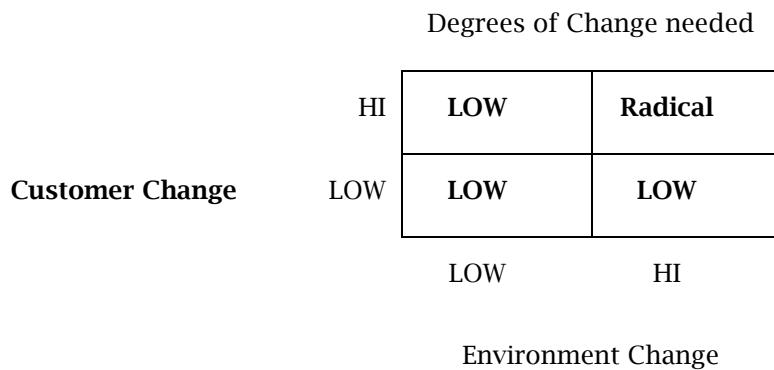
⁷¹ Other Government Agency.

⁷² U.S. Department of Transportation.

⁷³ Time Phased Force Deployment Data.

in the midst of battle. Perhaps stage setting and lead up to war can occur at preliminary workshops.”

- “Medical and aviation log are too specific to be broadly applicable across the JLEnt. Perhaps choose C1, III, and V.
 - How to set and surge the theater?
 - How to better integrate joint, interorganizational and multinational partners including information, planning and execution?
 - How to reduce the sustainment footprint but maintain capability?”
- “How do we communicate, cooperate, collaborate between US log community (≠JLEnt) and other country’s or region’s log community? Especially, I’m curious about multinational contract which will face some difficult problems regarding to prioritize needs/demands which will be brought by multinational operations. Exp. F-35/C17 global supply chain.”



- “The DoD is now in the high customer and environmental change quadrant. Radical innovation is needed. Culture promotes radical innovation. Incentives for those outside the DoD, incentives are for status quo.”
- “Colors of money – important issue that concerns a lot of DoD agencies. Crossing title 10 and title 22 funding lines, the use of NON-TWCF (Transportation Working Capital Fund) movement, allowing revenue cargo aboard NON-Revenue air or sealifts missions. In short, asset sharing and revenue capture to support TWCF.”
- “How to expose logistic resource and sustainment and capacity data to JLEnt entities...TAV, ITV
 - Where is my stuff?
 - Where is ‘our’ stuff?
 - Where is JLEnt stuff?
 - Where is their stuff?
 - JTF and COCOM logistics IT tools - JLEnt COP for logistics?

- o Coalition logistics IT tools
- o GCSS-J⁷⁴ functional review
- o USAID/OFDA logistics IT⁷⁵ tools
- o MiTaM procedures.”

⁷⁴ Global Combat Support System - Joint.

⁷⁵ Information Technology.

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Appendix H: Recommendations for Future LOGWAR Events

Based on observations collected during LOGWAR-15, we present recommendations for future LOGWAR events.

Targeted participants

The purpose of LOGWAR-15 was to further efforts to implement the JLEnt concept, which imagines a much wider and deeper interaction not only among the various military services, but also with industry, the commercial sector, nongovernmental and international organizations, and coalition partners and allies, as well as other branches of the U.S. government. As such, of key importance to the game (particularly as this was the first in the game series) was having representation of this range of organizations.

As is evident from the participant list (Appendix F above), DoD representation outweighed representation of any other group (47 participants, compared with 1 NGO participant, 2 IO participants, 9 industry/commercial sector participants, 6 ally participants, and 6 U.S. Government participants).

If the game is a tool for strengthening DoD's social network with non-DoD JLEnt partners (and JLEnt partners' relationships with each other), and for understanding players' capacities, capabilities, and intent to cooperate with each other, we recommend ensuring higher participation from non-DoD organizations (in particular, we recommend involving NGOs in the planning stages, so they will have reasons to be invested in NGO participation in the actual game). If, however, the game is a tool for exploring DoD's actions and internal decisions during a JLEnt situation, we recommend the non-DoD organizations be played by the white (facilitation) cell.

Number of players

Closely related to the first recommendation, it is critical not only to have the right people in the room, but also the right number of people.

There is a deep tie between the game purpose/design and the number of players. Beyond the number of players prescribed in the game design, others who wish to attend have the option of coming as observers (depending on the game location and other logistics, observers may need to watch from another space/room via webcast).

As the first in a series of games, LOGWAR-15 had two purposes:

- for each JLEnt partner organization involved to develop a better understanding of the requirements—including social networking requirements—associated with implementing the JLEnt, and
- to learn about best practices for the subsequent games in the series.

Thus, ideally the event would have included two simultaneous lines of discussion, one for each bullet above. For both, it was important to keep the number of participants limited to one or two players per organization, to enable each to have meaningful interactions, have time to provide their input, and have an environment conducive for all players to provide feedback. If two players are invited from each organization, careful consideration should be given to what role the second person would play, and whether it is absolutely necessary.

We recommend limiting attendance to the minimum number of players required to meet game objectives for each future LOGWAR game. The potential richness provided by additional players must be balanced with additional complexity and time limitations.

Aligned scenario

LOGWAR-15 focused on two unrelated components of a complex emergency: medical support and retrograde maintenance. Integrating these two components was challenging. The choices were to either play both components at the same time with players divided by medical support and retrograde maintenance (this is complicated for game facilitators and players), or to take turns, leaving one group inactive while the other group played.

For successful game dynamics, it is important to have a digestible scenario with clear objectives, and to keep all players engaged (i.e., the scenario should ensure categories of players/individual players are all actively playing throughout the game).

We recommend basing each future game on a singular topic, for player engagement and for their clarity with respect to game objectives.

Real versus notional geography

LOGWAR-15 used notional geography, which always presents challenges because of the time and resources required to ensure all players have a shared understanding of the world in which they are playing. For example, in this game, players did not have an intuitive understanding of the existing capabilities in the target or the allied nation, particularly in the context of medical logistics—this needed to be established and communicated by the game facilitators, which takes time.

We recommend game scenarios use real geography, with details derived from unclassified sources such as Wikipedia or Jane's Information Group. Alternatively, if notional geography is absolutely required, the game designers and sponsors should build in time for planning and executing a significant amount of game prep for the players.

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